



## **Operations Monitoring Report**

**First Quarter FY15**

**Prepared by:**

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

**October 31, 2014**

## **I. Executive Summary**

A review of the fiscal year 2015 (FY15) 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 2015 to date, CNE has satisfactorily met all of the contract obligations to Metro and has had no contract violations.

For the First Quarter FY15, the chilled water sales increased approximately 2.5% over the previous First Quarter (FY14). The First Quarter FY15 saw an increase in cooling degree days by approximately 1.6%. The peak chilled water demand for the current quarter was 19,159 tons, which is 7.7% higher than the previous First Quarter.

Steam sendout for the current quarter increased by approximately 12% over the previous First Quarter, marked by a increase in the number of heating degree days. Likewise, steam sales also increased by approximately 17.5% over the previous First Quarter. Steam system losses, as a percentage of sendout, decreased, and the total losses decreased approximately 2.3% over the previous First Quarter. The peak steam demand for the current quarter was 61,781 pounds per hour, which represents an increase in the First Quarter demand by approximately 19%.

The Energy Generating Facility (EGF) performance continues to surpass the System Performance Guarantee (Guaranteed Maximum Quantity or GMQ) levels. The chilled water plant electric consumption continues to perform considerably lower than the guaranteed levels but increased from the previous First Quarter. The steam plant electric consumption increased marginally over the previous First Quarter, but the amount of electricity per unit of sales decreased by approximately 14.5%. The steam plant fuel efficiency has decreased marginally from the previous First Quarter. The total water consumption for the steam and chilled water plants increased approximately 8% from the previous First Quarter marked by a 6.2% increase in the EDS make-up for the chilled water system and an 89.5% increase in the steam plant usage.

Work continued on DES Capital and Repair & Improvement Projects during the First Quarter of FY15. Repair and Improvements to the EDS continue as scheduled.

The current fiscal year system operating costs to date are \$5,697,227. This value represents approximately 25.7% of the total budgeted operating cost for FY15. The customer revenues from the sales of steam and chilled water for FY15 (to date) are \$5,652,648 which is approximately 27.8% 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 FY15 is \$462,375 (25% of budget). However, the actual MFA required cannot be accurately calculated due to outstanding invoices.

---

## Table of Contents

<b>Section</b>	<b>Description</b>	<b>Page</b>
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 FY15 Open Projects .....	15
	B. First Quarter FY15 Closed Projects.....	17
	C. Capital Projects Budget.....	17
V.	Energy Distribution System Repair, Improvements, PM and Emergencies....	17
	A. Repairs and Improvements .....	17
	B. Preventive Maintenance.....	18
	C. Emergencies.....	18
	D. EDS Walk-through.....	18
VI.	Customer Relations .....	19
	A. Marketing.....	19
	B. Customer Interaction.....	19
VII.	Recommendations.....	19

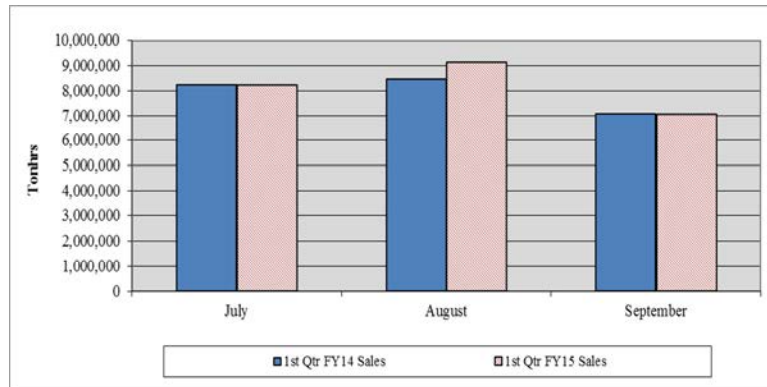
## II. Energy Distribution Sales and Performance

### 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

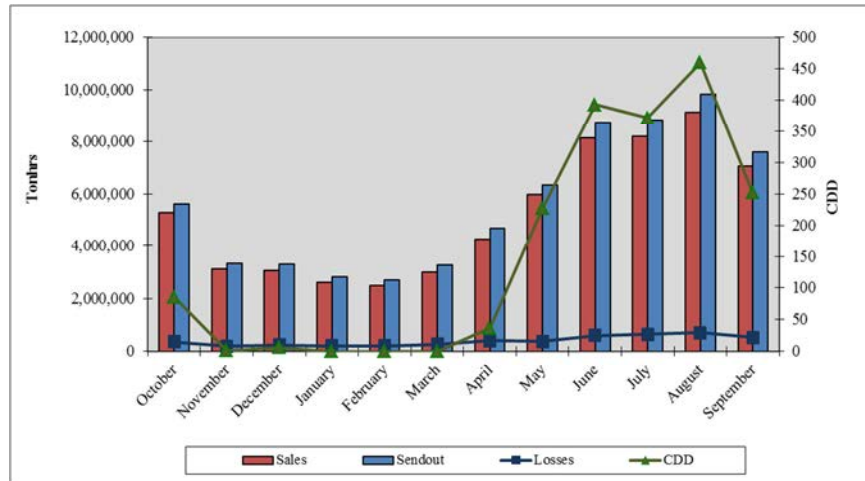
A comparison for the First Quarter chilled water sales is shown in Figure 1. This data reflects a 2.5% increase in sales for the current quarter over the same quarter of the previous fiscal year.



**Figure 1. First Quarter FY15 Sales Comparison**

The peak chilled water demand for the current quarter was 19,159 tons, which represents a 7.7% increase over the previous First Quarter.

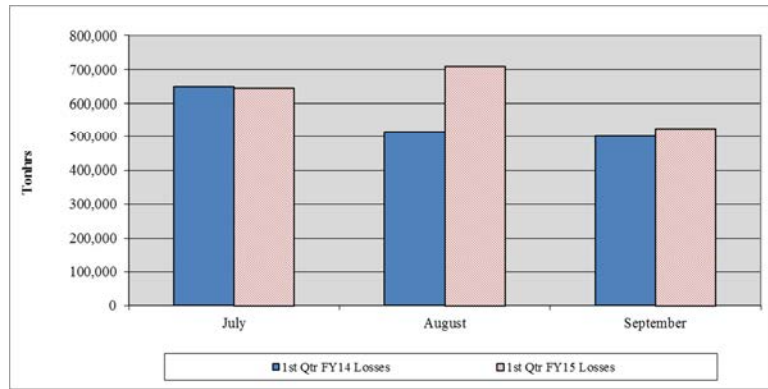
Figure 2 shows the chilled water sales, sendout and losses for the previous twelve months. The losses on this figure are defined as the difference in tonhrs per month between the recorded sendout and sales values and represent the total energy loss for chilled water in the EDS. The number of cooling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

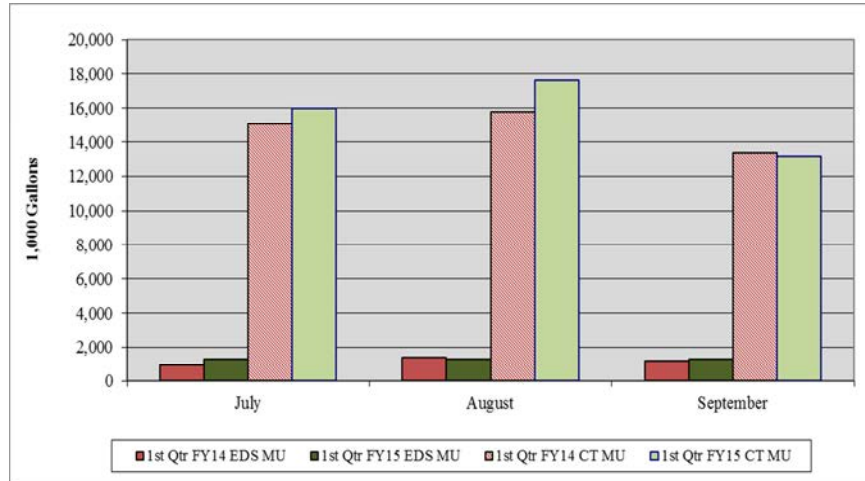


**Figure 3. Chilled Water System Loss Comparison for the First Quarter FY15**

The EDS make-up increased by approximately 9.4% over the previous First Quarter despite numerous attempts by CNE to locate the source of the water leaks. However, the total EDS water usage represents only a small part of the total EGF water usage for the quarter.

The total energy losses have increased by approximately 13% over the previous First Quarter. The make-up to the cooling towers increased 5.9% during the quarter. The number of cycles of concentration in the condensing water circuit

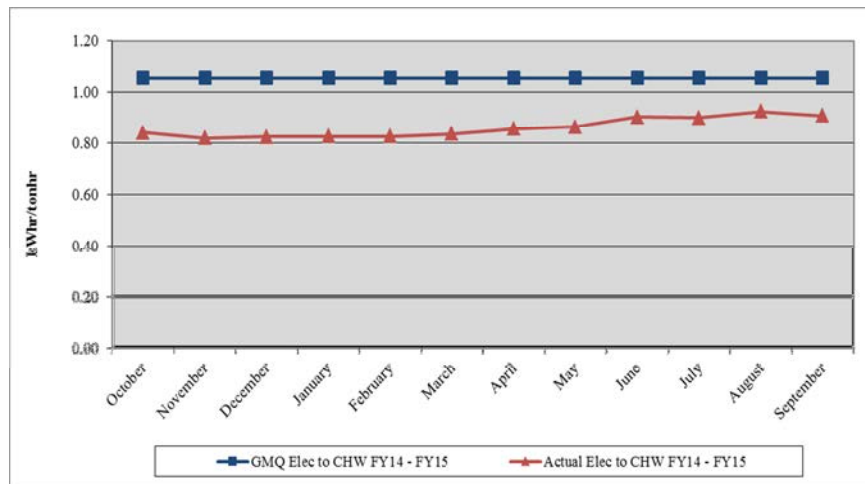
experienced a 32% decrease during the current quarter. The overall city water make-up comparison for the chilled water system is shown in Figure 4.



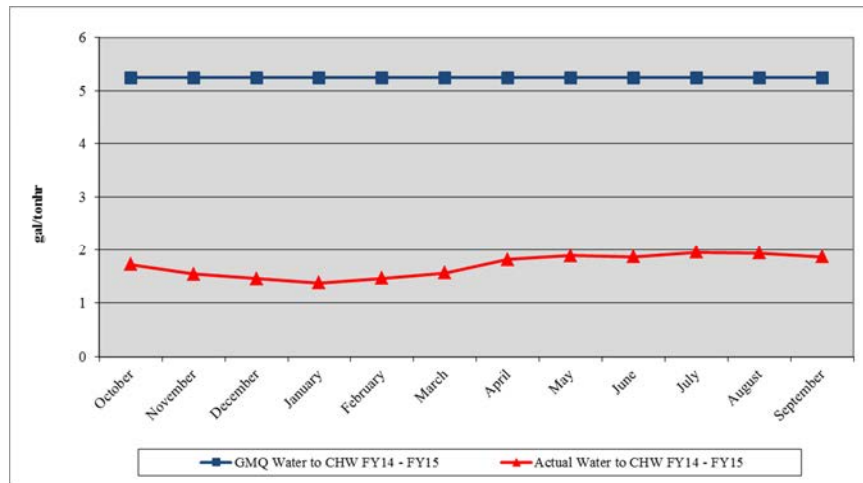
**Figure 4. Chilled Water System City Water Usage Comparison**

### 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**

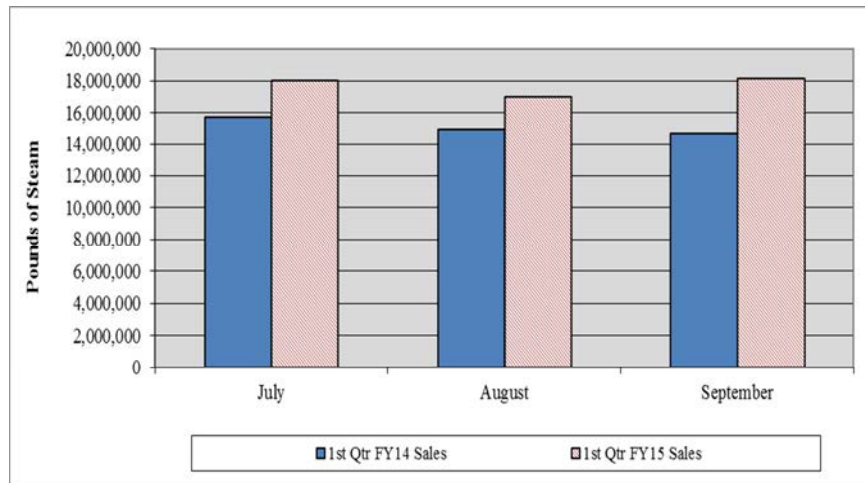
The chilled water allocation of the electric consumption falls under the GMQ limit of 1.055 kWhr per tonhr for the current quarter, and no excursion is reported for the current fiscal year. The chiller plant electric usage for the current quarter increased approximately 9.5% over the First Quarter for FY14. The actual electric conversion factor increased 6.8% in the quarter to 0.911 kWhr per tonhr.

The actual chilled water plant water conversion factor increased approximately 3.6% over the previous First Quarter. The total consumption of city water for the chiller plant for the current quarter increased approximately 6.2%.

**B. Steam**

**1. Sales and Sendout**

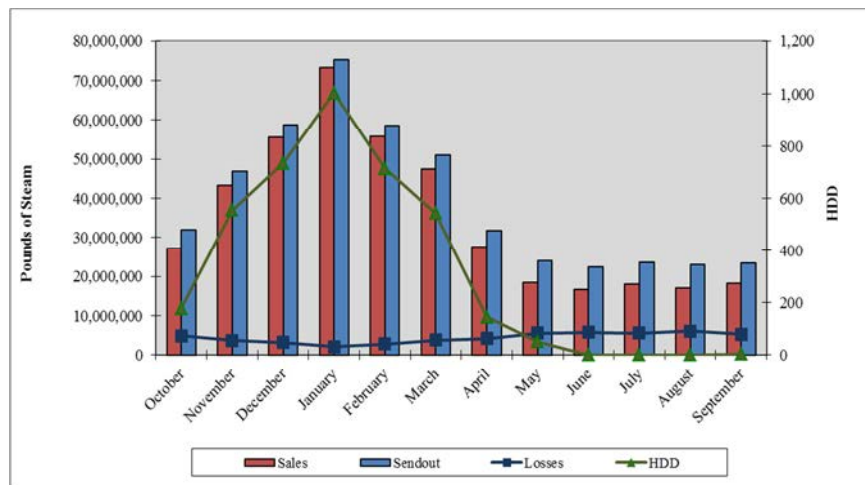
The steam sendout increased by approximately 12.1% over the previous First Quarter (FY14), and the sales increased by approximately 17.5%. The number of heating degree days decreased 50% over the previous First Quarter, which represents an increase from 2 to 3 heating degree days. The steam system losses decreased 2.3% over the previous First Quarter. A comparison for the First Quarter steam sales is shown in Figure 7.



**Figure 7. Steam Sales Comparison for the First Quarter FY15**

The peak steam demand for the current quarter was 61,781 pph, which reflects an approximate 18.8% increase 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.



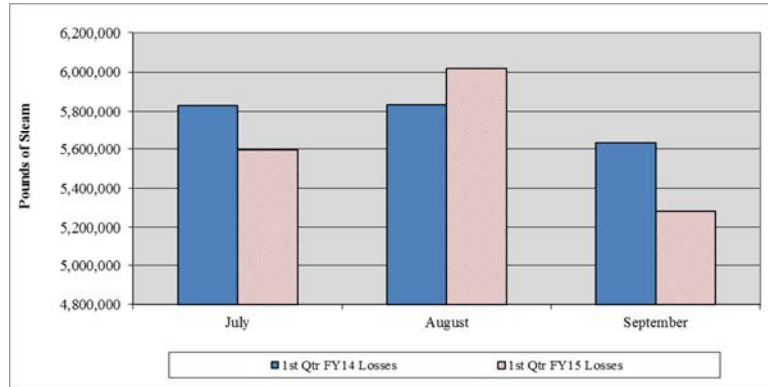
**Figure 8. Steam Sales, Sendout, Losses and HDD for the Previous Twelve Months**

## 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

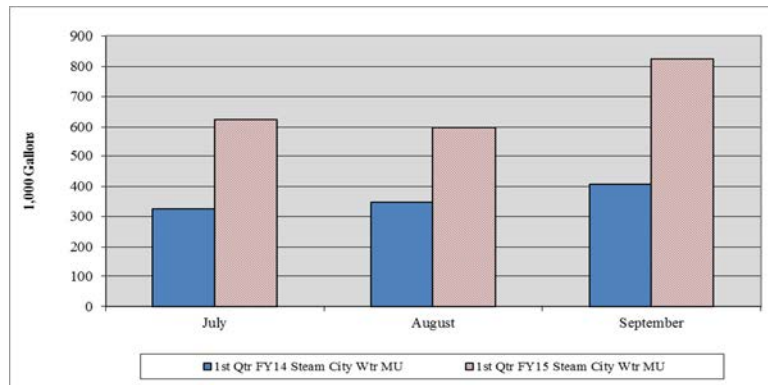


the EGF and the customer meters, resulting in a mass loss at steam traps. Faulty traps, steam leaks or meter error could also be a contributing cause of these losses.



**Figure 9. First Quarter FY15 Steam System Losses**

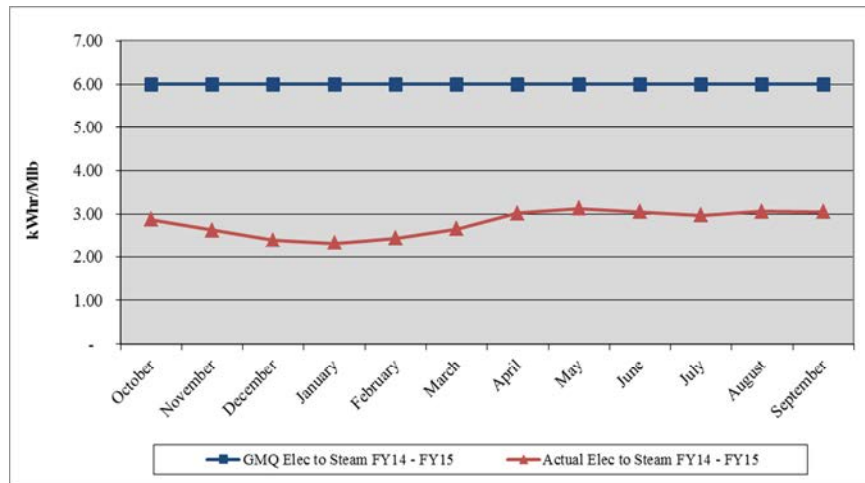
The amount of city water make-up (MU) to the steam system consists of the loss in mass between the EGF and the customers, in the condensate return from the customers to the EGF and losses at the EGF. This data is shown in the comparison of First Quarter data in Figure 10.



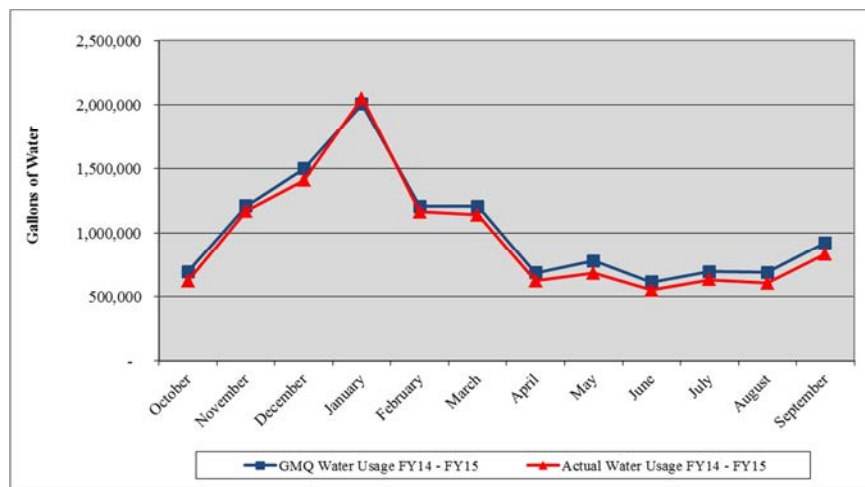
**Figure 10. First Quarter FY15 Steam System City Water Make-up Comparison**

### 3. Performance

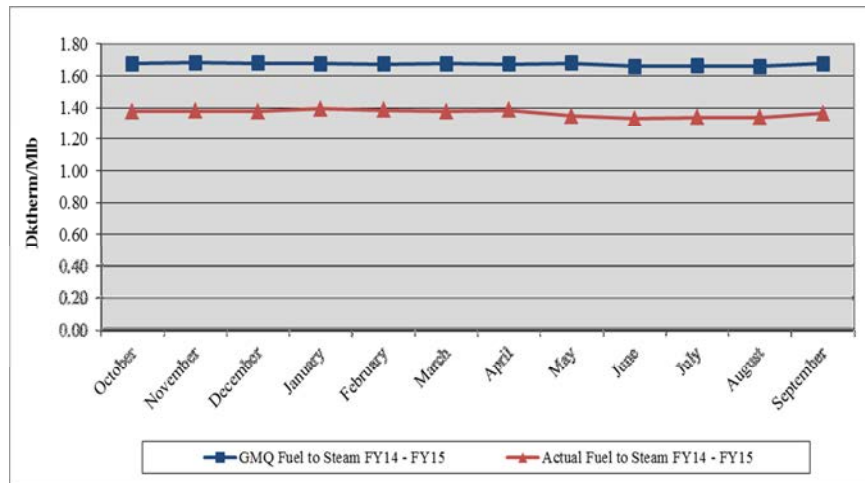
The performance of the steam system aspect of the EGF is presented by the following three charts, Figures 11, 12 and 13. Under the management of CNE, the System Performance Guarantee levels as described in the ARMA are being achieved satisfactorily.



**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 marginal increase in the steam plant electric consumption while experiencing a 14.5% decrease in the electric conversion factor. The water consumption for the steam plant increased 89.5% this quarter as compared to the previous First Quarter. The fuel consumption per unit of steam sales is relatively constant throughout the year and when compared to the historic data. The boiler plant fuel efficiency decreased 1.1% for the current quarter.

### C. Contract Guarantee Performance

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

**Table 1. First Quarter FY15 Production, Sales and Consumption Summary**

Item	Unit	First Quarter FY15	First Quarter FY14	*Percent Difference
	days	92	92	0.00%
<b>Total Electric Use</b>	kWhrs	22,393,989	20,457,250	9.47%
Chilled Water	kWhrs	22,233,167	20,297,215	9.54%
Steam	kWhrs	160,822	160,035	0.49%
<b>Total Water Use</b>	kgal	52,723	48,806	8.03%
Total Chilled Water	kgal	50,675	47,725	6.18%
EDS Make-up	kgal	3,886	3,551	9.43%
Cooling Towers	kgal	46,789	44,174	5.92%
Calc CT Evaporation	kgal	39,203	39,041	0.41%
CT Blowdown	kgal	7,586	5,133	47.79%
Calc # Cycles		5.17	7.61	-32.06%
Steam	kgal	2,048	1,081	89.45%
<b>Total Fuel Use</b>	mmBTU	94,468	83,408	13.26%
Natural Gas	mmBTU	94,443	83,400	13.24%
Propane	mmBTU	25	8	n.a.
<b>Condensate Return</b>	kgal	6,593	6,462	2.03%
	lbs	53,772,335	52,701,472	2.03%
Avg Temp	°F	187.3	175.0	7.05%
<b>Sendout</b>				
Chilled Water	tonhrs	26,276,500	25,456,900	3.22%
Steam	lbs	70,092,000	62,550,000	12.06%
Peak CHW Demand	tons	19,159	17,794	7.67%
Peak Steam Demand	lb/hr	61,781	52,000	18.81%
CHW LF		62.11%	64.79%	-4.13%
Steam LF		51.38%	54.48%	-5.68%
<b>Sales</b>				
Chilled Water	tonhrs	24,394,278	23,791,965	2.53%
Steam	lbs	53,199,086	45,258,871	17.54%
<b>Losses</b>				
Chilled Water	tonhrs	1,882,222	1,664,935	13.05%
Steam	lbs	16,892,914	17,291,129	-2.30%
		24.10%	27.64%	-12.82%
<b>Degree Days</b>				
CDD		1,084	1,067	1.59%
HDD		3	2	50.00%

\*positive percent difference values imply an increase from FY14 to FY15

**Table 2. First Quarter FY15 Performance Guarantee Comparison for Steam and Chilled Water**

GMQ Calculations	Unit	First Quarter FY15	First Quarter FY14	*Percent Difference
<b>Steam</b>				
GMQ Elec Conversion	kWhr/Mlb	6.00	6.00	
Electric Conversion	kWhr/Mlb	3.02	3.54	-14.51%
GMQ Plant Efficiency	Dth/Mlb	1.666	1.663	
Plant Efficiency	Dth/Mlb	1.348	1.333	1.07%
Actual %CR		76.72%	84.25%	-8.95%
Avg CR Temp	°F	187	175	7.05%
GMQ Water Conversion	gal	2,301,123	1,388,673	
Water Conversion	gal	2,068,480	1,091,810	89.45%
<b>Chilled Water</b>				
GMQ Elec Conversion	kWhr/tonhr	1.055	1.055	
Electric Conversion	kWhr/tonhr	0.911	0.853	6.83%
GMQ Water Conversion	gal/tonhr	5.25	5.25	
Water Conversion	gal/tonhr	2.08	2.01	3.56%

\*positive percent difference values imply an increase from FY14 to FY15

#### 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, in part, due to the remaining capacity at the EGF that was included in the original construction and remains unsold. This capacity is available for potential future customers.

The system operating costs for FY15 to date are \$5,697,227. This value represents approximately 25.7% of the total budgeted operating cost for FY15 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 to the First Quarter have not been issued or paid at the time of this report. The customer revenues from the sales of steam and chilled

water for FY15 are \$5,652,648 which is approximately 27.8% of the budgeted amount. The MFA transferred to date is \$462,375 (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	FY15 Budget	First Quarter Expenses	Second Quarter Expenses	Third Quarter Expenses	Fourth Quarter Expenses	Total Spending to Date	% of Budget
<b>Operating Management Fee</b>							
FOC: Basic	\$ 4,374,300	\$ 1,076,159	\$ -	\$ -	\$ -	\$ 1,076,159	24.60%
9th Chiller	\$ 41,000	\$ 10,084	\$ -	\$ -	\$ -	\$ 10,084	24.59%
C/O 6A	\$ 80,900	\$ 19,912	\$ -	\$ -	\$ -	\$ 19,912	24.61%
C/O 6B	\$ 70,900	\$ 17,429	\$ -	\$ -	\$ -	\$ 17,429	24.58%
C/O 7	\$ 26,700	\$ 6,566	\$ -	\$ -	\$ -	\$ 6,566	24.59%
C/O 8	\$ 13,000	\$ 2,873	\$ -	\$ -	\$ -	\$ 2,873	22.10%
Pass-thru Charges: Chemical Treatment	\$ 151,500	\$ 60,541	\$ -	\$ -	\$ -	\$ 60,541	39.96%
Insurance	\$ 31,200	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Marketing: CES Sales Activity	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Incentive Payments	\$ 12,400	\$ 3,139	\$ -	\$ -	\$ -	\$ 3,139	25.32%
FEA: Steam	\$ -	\$ 24,860	\$ -	\$ -	\$ -	\$ 24,860	n.a.
Chilled Water	\$ -	\$ 147,576	\$ -	\$ -	\$ -	\$ 147,576	n.a.
Misc: Metro Credit	\$ -	\$ (220,970)	\$ -	\$ -	\$ -	\$ (220,970)	n.a.
ARFA	\$ -	\$ 15,630	\$ -	\$ -	\$ -	\$ 15,630	n.a.
Deferral	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
<b>Subtotal - Man Fee =</b>	<b>\$ 4,801,900</b>	<b>\$ 1,163,799</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 1,163,799</b>	<b>24.24%</b>
<b>Reimbursed Management Fee + Chem Treatment</b>		\$ 458,659	\$ -	\$ -	\$ -	\$ 458,659	0.00%
<b>Metro Costs</b>							
Pass-thru Charges: Engineering	\$ 8,700	\$ 11,283	\$ -	\$ -	\$ -	\$ 11,283	129.69%
EDS R&I Transfers	\$ 275,100	\$ 70,350	\$ -	\$ -	\$ -	\$ 70,350	25.57%
Metro Marketing	\$ 10,000	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Project Administration	\$ 27,900	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Metro Incremental Cost	\$ 524,500	\$ 92,815	\$ -	\$ -	\$ -	\$ 92,815	17.70%
Utility Costs: Water/Sewer	\$ 724,600	\$ 201,426	\$ -	\$ -	\$ -	\$ 201,426	27.80%
EDS Water/Sewer	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
EDS Electricity	\$ -	\$ 19,544	\$ -	\$ -	\$ -	\$ 19,544	n.a.
Electricity	\$ 6,574,600	\$ 2,487,218	\$ -	\$ -	\$ -	\$ 2,487,218	37.83%
Natural Gas Consultant	\$ 99,600	\$ 4,000	\$ -	\$ -	\$ -	\$ 4,000	4.02%
Natural Gas Transport	\$ -	\$ 30,100	\$ -	\$ -	\$ -	\$ 30,100	n.a.
Natural Gas Fuel	\$ 3,657,600	\$ 410,315	\$ -	\$ -	\$ -	\$ 410,315	11.22%
Propane	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
<b>Subtotal - Metro Costs =</b>	<b>\$ 11,902,600</b>	<b>\$ 3,327,051</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 3,327,051</b>	<b>27.95%</b>
<b>Subtotal - Operations =</b>	<b>\$ 16,704,500</b>	<b>\$ 4,490,850</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 4,490,850</b>	<b>26.88%</b>
<b>Debt Service</b>							
2012 Bonds	\$ 3,476,900	\$ 869,146	\$ -	\$ -	\$ -	\$ 869,146	25.00%
2005 Bonds -Self Funded	\$ 811,800	\$ 343,978	\$ -	\$ -	\$ -	\$ 343,978	42.37%
2007 Bonds -Self Funded	\$ 210,000	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
2008 Bonds -Self Funded	\$ 208,900	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
2010 Bonds -Self Funded	\$ 207,300	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
MCCC Fund -Self Funded	\$ 731,000	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Interest & Misc Revenue	\$ (175,800)	\$ (6,747)	\$ -	\$ -	\$ -	\$ (6,747)	3.84%
MIP	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Oper. Reserve Fund	\$ 600	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
<b>Subtotal - Capital =</b>	<b>\$ 5,470,700</b>	<b>\$ 1,206,377</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 1,206,377</b>	<b>22.05%</b>
<b>Total =</b>	<b>\$ 22,175,200</b>	<b>\$ 5,697,227</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 5,697,227</b>	<b>25.69%</b>
<b>Customer Revenues</b>							
Taxes Collected		\$ 109,142	\$ -	\$ -	\$ -	\$ 109,142	n.a.
Taxes Paid		\$ 36,962	\$ -	\$ -	\$ -	\$ 36,962	n.a.
Penalty Revenues/Credits		\$ (103,266)	\$ -	\$ -	\$ -	\$ (103,266)	n.a.
Energy Revenues Collected		\$ 5,683,734	\$ -	\$ -	\$ -	\$ 5,683,734	n.a.
<b>Revenues =</b>	<b>\$ 20,325,700</b>	<b>\$ 5,652,648</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 5,652,648</b>	<b>27.81%</b>
<b>Metro Funding Amount =</b>	<b>\$ 1,849,500</b>	<b>\$ 44,579</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 44,579</b>	<b>2.41%</b>

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	\$ 1,216,312	6,691,372	\$ 0.1818	\$ 298,542	10,059	\$ 29.6789
State Government	\$ 1,102,141	5,477,063	\$ 0.2012	\$ 418,220	14,347	\$ 29.1508
Metro Government	\$ 2,071,446	12,225,843	\$ 0.1694	\$ 577,073	28,793	\$ 20.0420
New Customers	\$ 1,329,873	8,023,150	\$ 0.1658	\$ 365,969	23,739	\$ 15.4165
<b>Total</b>	<b>\$ 4,389,899</b>	<b>24,394,278</b>	<b>\$ 0.1800</b>	<b>\$ 1,293,835</b>	<b>53,199</b>	<b>\$ 24.3206</b>

Total Revenue	\$	5,683,734
True-up and Adjustments (Net)	\$	(31,086)
Net Revenue	\$	5,652,648

### III. EGF Operations

Items relating to the facility operations presented herein are derived from the monthly reports issued by CNE for FY15. 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.

- Due to a significant swing in the Music City Center's steam demand on July 10, the steam sendout pressure dropped to a low of 122 psig for approximately one hour.
- On July 25, the boiler sendout pressure dropped to a low of 95 psig due to a failure of the #1 boiler feed water regulating valve. The system pressure was restored within seventy-five minutes.
- The chilled water sendout temperature increased beyond the normal operating range for approximately sixteen minutes on August 13<sup>th</sup> due to an electrical disruption from NES.
- 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

The semi-annual emissions monitoring report was issued to the Metro Nashville Health Department during the quarter. No environmental violations were reported during the quarter.

Monthly safety meetings were held on Hazardous Communications, Blood-borne Pathogens, Heat and Cold Stress and Confined Space Entry.

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 77% of the steam sendout during the quarter which represents a decrease of approximately 9% over the previous First Quarter. The decrease in condensate return was due to finding hardness in the condensate which prompted CNE to begin dumping some of the condensate until the source of the hardness was determined. The source was determined to be from a leaking heat exchanger at a customer building that was isolated and repaired by the customer.
- Condensing Water System
  - The conductivity of the condensing water continues normal with only a few excursions resulting in high cycles of concentration and low blowdown rates.



- Chilled Water System
  - During the quarter, the presence of some peculiar water chemistry at several of the customers' buildings prompted an investigation by TEG, CNE and their water treatment company. The source of problem continues to be investigated, but the effect appears to decrease the heat transfer potential at customer coils and heat exchangers, which may be affecting the system differential temperature.

#### 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 motor for #10 cooling tower was replaced.
- The spray nozzles in #2 de-aerator were replaced.
- Several boiler valves were replaced or rebuilt during the quarter.
- The fan belt for #18 cooling tower was replaced.
- Approximately 100 pounds of refrigerant was added to #4B chiller.
- Several leaks and other repairs were made on the chemical feed and monitoring equipment.
- 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 23, 2014, 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.

- Many of the housekeeping items noted in the previous walk-through have been repaired or resolved.
- 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. Cooling tower #13 showed a significant amount of corrosion which CNE plans on addressing in FY15.
- Other minor items remaining include:
  - Cobwebs have reformed in various places throughout the plant and on motor control center #4 located near the boilers; these should be removed. However, progress has been made in removing these cobwebs.

## 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 FY15 Open Projects

The following projects remained open at the end of the First Quarter FY15.

#### 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. DES089 – AA Birch Tunnel Repairs

The AA Birch Tunnel houses the chilled water, steam and condensate return service piping that supplies the AA Birch Building. It is a 5-1/2 foot diameter tunnel bored through solid rock and varies from approximately 20 feet below the street surface to 40 feet below the street surface. Groundwater infiltration into the AA Birch Tunnel has caused some of the tunnel surface rock to loosen and fall off into the tunnel floor. Not only does this present a safety hazard to maintenance personnel, but, if left unchecked, can result in compromise of the tunnel structure.

This project involves the reinforcement of the tunnel roof and upper side walls with rebar/wire mesh and shotcrete and the placement of drainage wicks and channels to direct the groundwater infiltration to the tunnel lower sidewalls and floor for drainage and collection. This project was bid during the 1<sup>st</sup> Quarter of FY15 with bids scheduled to be received at the beginning of the 2<sup>nd</sup> Quarter FY15. It is anticipated that this work will begin, and be completed, during the 2<sup>nd</sup> Quarter FY15.

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

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

#### 4. DES091 – Thermal Storage and NES Time of Use Rates

A proposal is expected from a local programmer who may be able to implement the necessary program and programming changes to the CNE invoicing system to facilitate the necessary changes to allow DES to charge the customers their respective time of use rate for electricity used at the EGF.

5. DES 105 – Vertical Tunnel Shaft Repairs at Suntrust Building

Chilled water and steam services are supplied to the Suntrust Building on 4<sup>th</sup> Avenue North from the 4<sup>th</sup> Avenue Tunnel. Part of the tunnel structure for this service includes a 40 foot tall vertical shaft from the 4<sup>th</sup> Avenue Tunnel. This shaft is bored through solid rock and due to groundwater infiltration, the rock has started to fall from the vertical shaft's surfaces. Not only does this present a safety hazard to maintenance personnel, but, if left unchecked, can result in compromise of the vertical shaft structure.

This project involves the reinforcement of the walls of the vertical shaft with rebar/wire mesh and shotcrete and the placement of drainage wicks and channels to direct the groundwater infiltration to the lower portion of the vertical shaft. It also involves similar reinforcement of a portion of the 4<sup>th</sup> Avenue Tunnel directly below this vertical shaft. This project was bid during the 1<sup>st</sup> Quarter of FY15 with bids scheduled to be received at the beginning of the 2<sup>nd</sup> Quarter FY15. It is anticipated that this work will begin, and be completed, during the 2<sup>nd</sup> Quarter FY15.

6. DES 106 – Chilled Water Modifications at the Metro Courthouse

Phase II of this project is anticipated to be implemented during the Second Quarter FY15. This part of the project involves the addition of bypass piping around the heat exchanger to keep the flow of chilled water to the building when the unit is being cleaned in the future. Since this phase of the project will require an extensive shut-down of the building's cooling system, the Work will not begin until after the cooling season is over. The customer will determine if the cost and benefit warrants the installation.

7. DES 107 – Manholes A, B and M Repairs and Improvements

Manholes A, B and M are located adjacent to, or within, the bounds of the West Riverfront Project which includes the construction of an amphitheater along the river at the old waste-to-energy plant site. There is some maintenance and repair work which needs to take place within these manholes prior to the opening of the West Riverfront Park in July 2015. This project addresses these maintenance and repair items.

8. DES 109 – Indigo Hotel Sparge Tube Addition

Steam and condensate service piping for Wells Fargo passes through the basement of the Indigo Hotel located at 310 Union Street. The prior occupant of the Indigo Hotel building was connected to the district steam system and there is a steam trap assembly that used to drain to a condensate collection system within the Indigo Hotel's basement. Because this condensate collection system is no

longer in service, a condensate sparge tube needs to be added at this trap location in order to inject the trap's condensate directly into the condensate return piping. The design, bidding and construction for this sparge tube addition should be completed during the 2<sup>nd</sup> Quarter FY15.

**B. First Quarter FY15 Closed Projects**

There were no projects closed during the First Quarter FY15.

**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.

**Table 5. Capital Projects Expense Summary**

DES Project #	Description	Total Budget	FY15 Spending to Date	Total Spent to Date	Remaining Balance
<b>2010 Bond Projects -49109</b>					
DES070	MH 6 to 23 Cond Line	\$ 20,000	\$ -	\$ 527	\$ 19,473
DES071	Hermitage Hotel Ser Modifications	\$ 20,000	\$ -	\$ 1,119	\$ 18,881
DES072	Sheraton Stm & Cond Line	\$ 11,000	\$ -	\$ 10,462	\$ 538
DES091	NES Time of Use Electric Rate	\$ 100,000	\$ -	\$ 64,616	\$ 35,384
Total Closed Projects		\$ 1,814,533	\$ -	\$ 1,814,533	\$ -
Metro Project Admin		\$ -	\$ -	\$ -	\$ -
Project Man, Development, etc		\$ 444,467	\$ -	\$ -	\$ 444,467
<b>Total 2010 Bond</b>		<b>\$ 2,410,000</b>	<b>\$ -</b>	<b>\$ 1,891,257</b>	<b>\$ 518,743</b>
<b>Customer Connection Fund -49107</b>					
DES104	Time of Use/ Customer Billing	\$ 30,000	\$ 1,226	\$ 1,226	\$ 28,774
DES106	Courthouse CHW Heat Exchanger	\$ 10,000	\$ 6,928	\$ 9,654	\$ 346
Sub-Total Closed Projects		\$ 7,161,827	\$ -	\$ 6,526,463	\$ 635,364
Metro Project Admin		\$ 50,000	\$ -	\$ 39,413	\$ 10,587
Project Man, Development, etc		\$ 1,248,173	\$ -	\$ -	\$ 1,248,173
<b>Customer Connection Fund</b>		<b>\$ 8,500,000</b>	<b>\$ 6,928</b>	<b>\$ 6,575,530</b>	<b>\$ 1,924,470</b>

**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 \$276,966. Table 6 provides a summary of the FY15 expenditures and revenues to date associated with the R&I budget.



## **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 actual steam and chilled water loads on the MCC. However, several potential customers have contacted the DES asking for service.

### **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.

- The CSR coordinated several meetings between the customers, CNE, TEG and the contractors for particular projects that affected the steam, condensate and/or chilled water service to the customer.
- Several customer buildings were isolated during the quarter so that building personnel could make internal repairs.
- CNE coordinated meetings with customers in their search for chilled water leaks during the quarter.
- After reviewing the customer consumptions for the State buildings during the quarter, CNE and TEG suspected that there may be some unmetered steam at the Andrew Jackson building. CNE investigated and determined that all of the steam used by the building was being metered but that this building was using more steam than they had previously during the summer months.
- Meetings were held with the Renaissance Hotel regarding their water chemistry and the cleaning of their coils.
- Other minor issues and customer interactions are noted in the monthly CNE reports.

## **VII. Recommendations**

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

- Corroded structural steel within the vaults and tunnels should be cleaned and painted or replaced; TEG will 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.
- The additional steam traps which need repair or replacement should be addressed as soon as possible.
- Additional investigation is required to determine the source and solution for the fouling issue with the chilled water.