



## **Operations Monitoring Report**

**First Quarter FY14**

**Prepared by:**

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**October 31, 2013**

## I. Executive Summary

A review of the fiscal year 2014 (FY14) 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 2014 to date, CNE has satisfactorily met all of the contract obligations to Metro and has had no contract violations.

For the First Quarter FY14, the chilled water sales increased approximately 5% over the previous First Quarter (FY13) due primarily to an increase in the sales to the Music City Center. The First Quarter FY14 saw a 10.4% decrease in cooling degree days from the previous First Quarter. The peak chilled water demand for the current quarter was 17,794 tons, which is 8% higher than the previous First Quarter.

Steam sendout for the current quarter increased by approximately 17% over the previous First Quarter, but the number of heating degree days decreased by 91%. Likewise, steam sales also increased by approximately 33% over the previous First Quarter. The increase in steam sales is also attributable to the Music City Center. Steam system losses, as a percentage of sendout, decreased, and the total losses decreased by approximately 10% over the previous First Quarter. The peak steam demand for the current quarter was 52,000 pounds per hour, which represents a decrease in historic First Quarter demand by approximately 13%.

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 was slightly lower than the value from the previous First Quarter. The steam plant electric consumption increased approximately 6% over the previous First Quarter, but the amount of steam per unit of sales decreased 20%. The steam plant fuel efficiency has increased approximately 3.8% from the previous First Quarter due in part to an increase in the amount of condensate return. The total water consumption for the steam and chilled water plants decreased approximately 4.5% from the previous First Quarter marked by a 23% increase in the EDS make-up for the chilled water system and a 64% decrease in the steam plant usage.

Work continued on DES Capital and Repair & Improvement Projects during the First Quarter of FY14. The MH-1 Abandonment project (DES-101) and the MH-10 Roof Repair project (DES-100) were both completed during the quarter. Repair and Improvements to the EDS continue as scheduled.

The current fiscal year system operating costs to date are \$5,249,590. This value represents approximately 24.3% of the total budgeted operating cost for FY14. The customer revenues from the sales of steam and chilled water for FY14 (to date) are \$5,217,021 which is approximately 26.5% 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 FY14 is \$489,575 (25% of budget). However, the actual MFA required cannot be accurately calculated due to the outstanding invoices.

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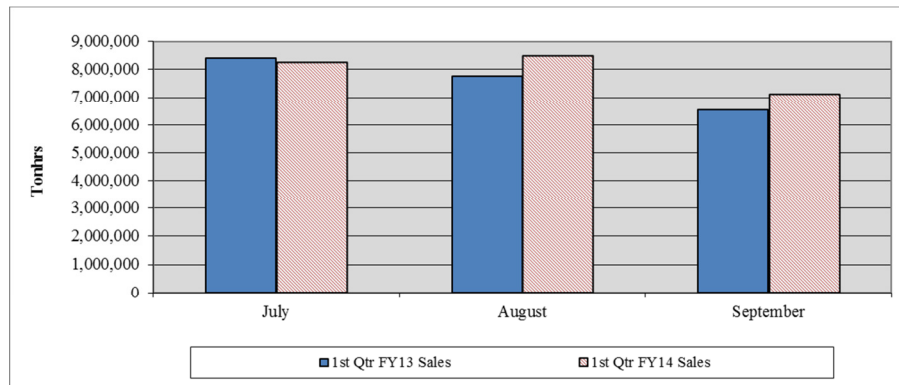
## II. Energy Distribution Sales and Performance

### A. Chilled Water

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

#### 1. Sales and Sendout

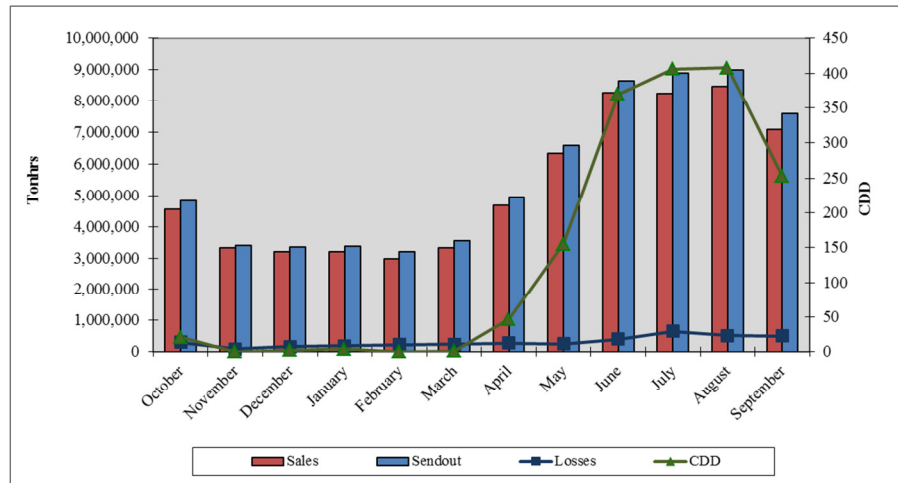
A comparison for the First Quarter chilled water sales is shown in Figure 1. This data reflects a 4.8% increase in sales for the current quarter over the same quarter of the previous fiscal year. The quarter also experienced a 10.4% decrease in the number of cooling degree days.



**Figure 1. First Quarter FY14 Sales Comparison**

The peak chilled water demand for the current quarter was 17,794 tons, which was slightly lower than in the Fourth Quarter FY13. This peak demand is approximately 8% higher than in the previous First Quarter.

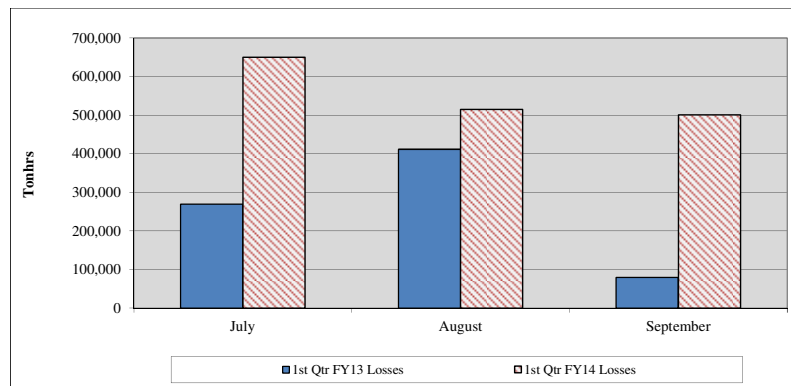
Figure 2 shows the chilled water sales, sendout and losses for the previous twelve months. The losses on this figure are defined as the difference in tonhrs per month between the recorded sendout and sales values and represent the total energy loss for chilled water in the EDS. The number of cooling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

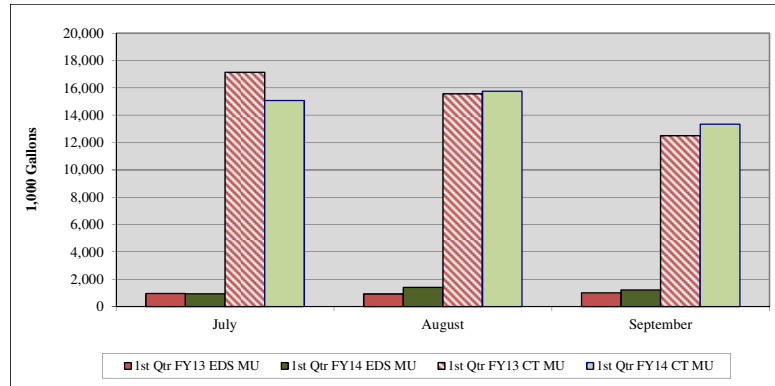
A comparison of the total, chilled water energy losses in the EDS for the First Quarter is shown in Figure 3. These losses are the difference in chilled water sendout and sales.



**Figure 3. Chilled Water System Loss Comparison for the First Quarter FY14**

The EDS make-up increased by approximately 23% over the previous First Quarter. 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 120% over the previous First Quarter, but the percent of losses as a function of sales has decreased by approximately 24%. The make-up to the cooling towers decreased by approximately 2% due to a milder than normal summer. The number of cycles of concentration in the condensing water circuit experienced a 40% increase during the current First Quarter due to improved

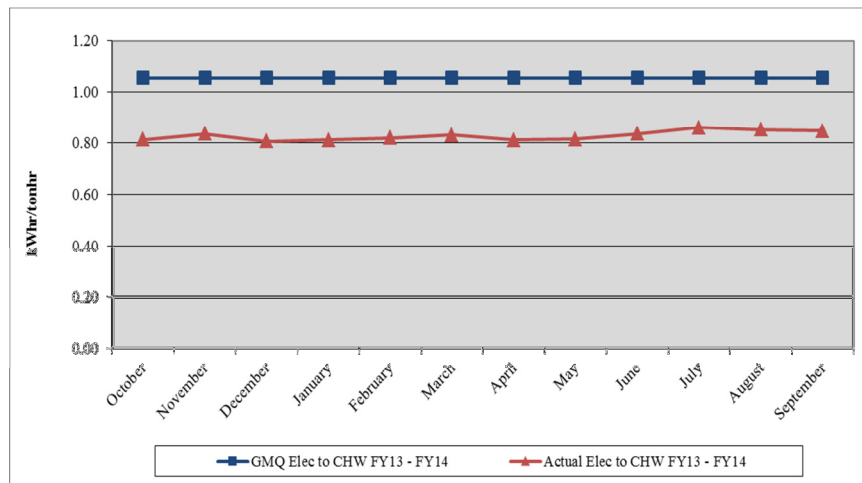
water chemistry in the cooling towers. The overall city water make-up comparison for the chilled water system is shown in Figure 4.



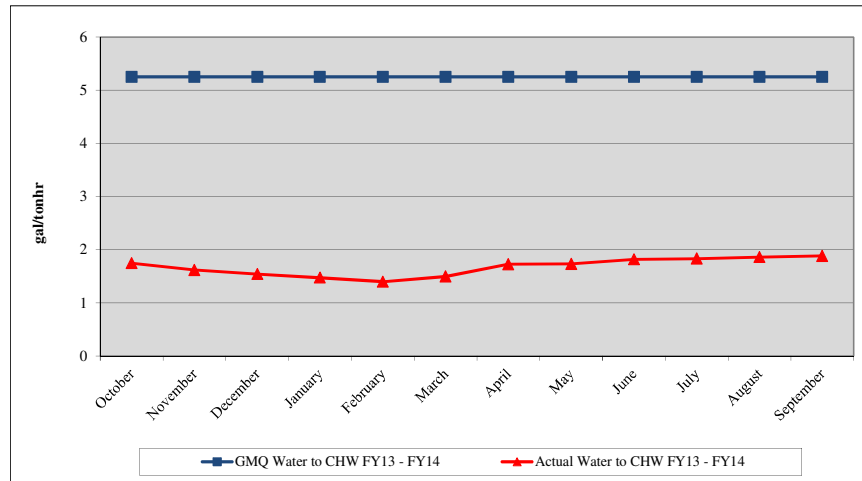
**Figure 4. Chilled Water System City Water Usage Comparison**

### 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 1.6% over the First Quarter for FY13. The actual electric conversion factor decreased 3.0% in the quarter to 0.853 kWhr per tonhr.

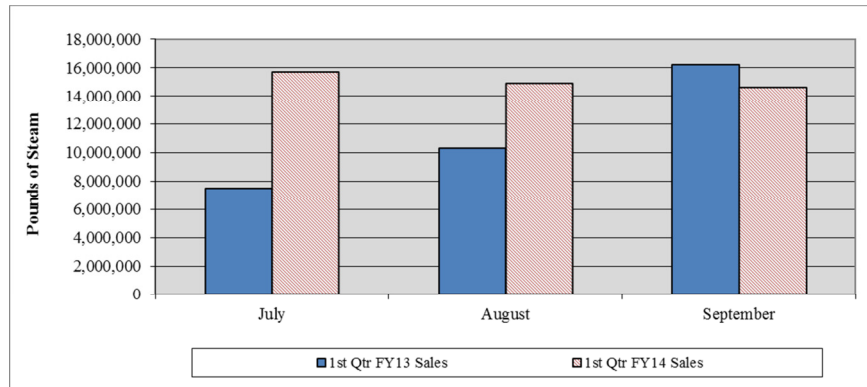
The actual chilled water plant water conversion factor decreased approximately 5.3% over the previous First Quarter. The total consumption of city water for the chiller plant for the current quarter is approximately the same as the previous First Quarter.

**B. Steam**

**1. Sales and Sendout**

The steam sendout increased by approximately 17.2% over the previous First Quarter (FY13), and the sales increased by approximately 33% due largely to the Music City Center. The steam system losses decreased approximately 23.5% relative to sendout. The number of heating degree days decreased by approximately 91% over the previous First Quarter. A comparison for the First Quarter steam sales is shown in Figure 7.

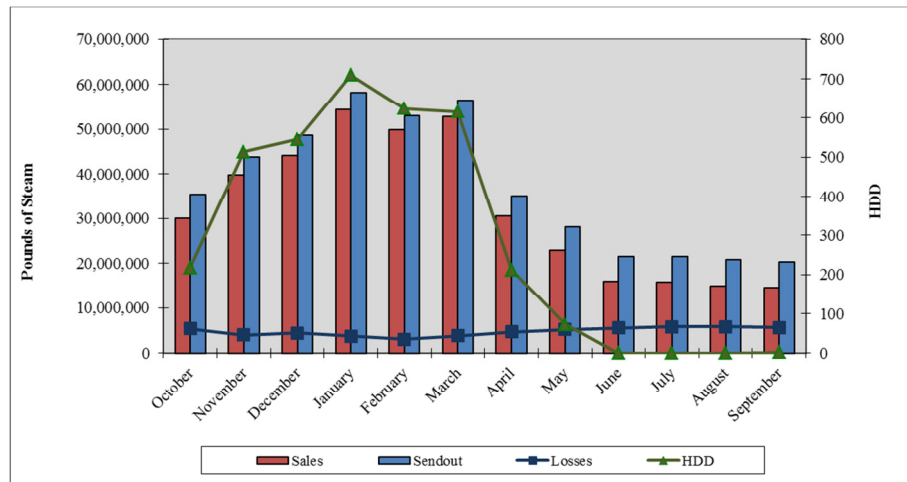




**Figure 7. Steam Sales Comparison for the First Quarter FY14**

The peak steam demand for the current quarter is 52,000 pph, which reflects an approximate 13% decrease in the peak steam production over the previous First Quarter.

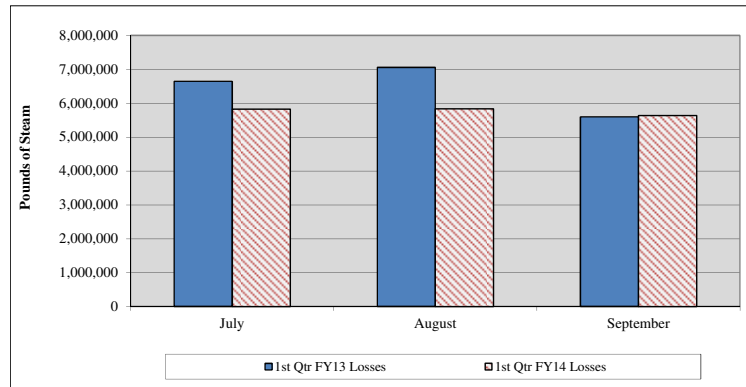
Figure 8 shows the steam sales, sendout and losses for the previous twelve months. The losses on this figure are defined as the difference in pounds per month between the recorded sendout and sales values and represent the total mass loss in the EDS between the EGF and the customer meters.



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

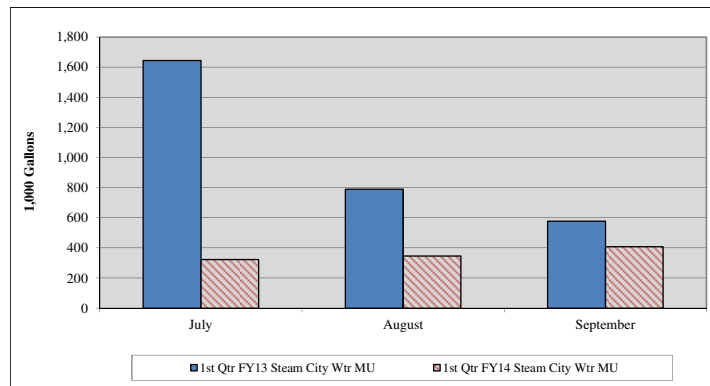
## 2. Losses

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.



**Figure 9. First Quarter FY14 Steam System Losses**

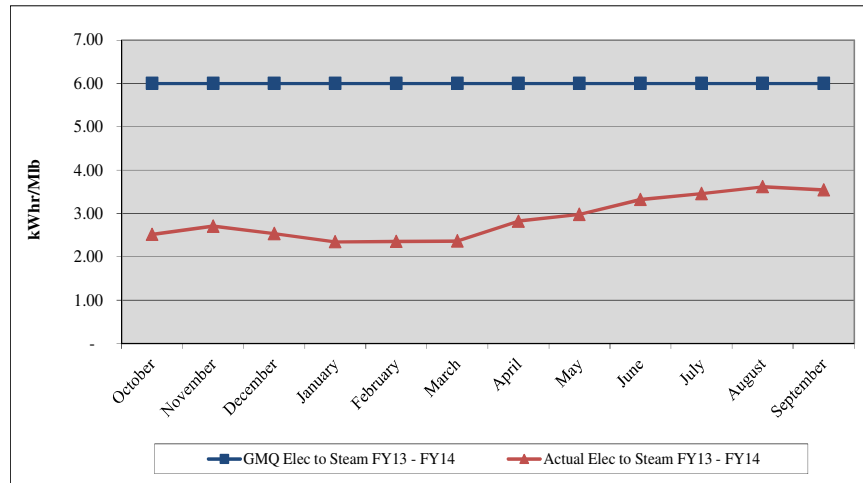
The amount of city water make-up (MU) to the steam system consists of the loss in mass between the EGF and the customers, in the condensate return from the customers to the EGF and losses at the EGF. This data is shown in the comparison of First Quarter data in Figure 10.



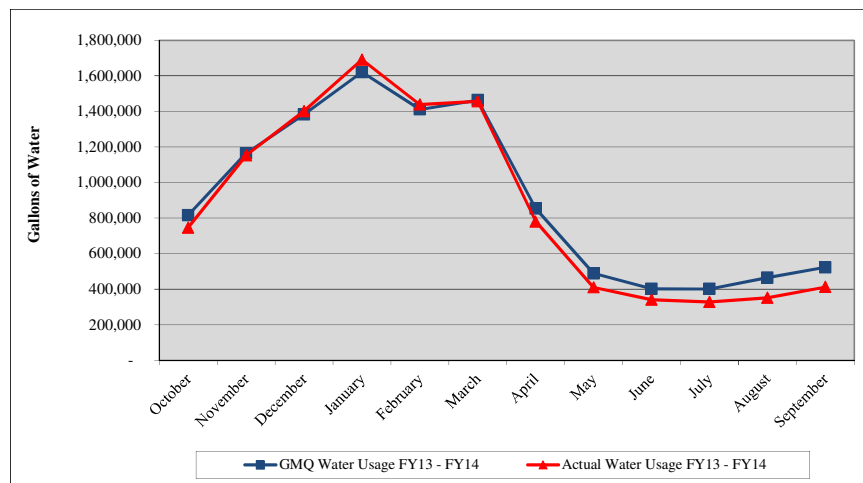
**Figure 10. First Quarter FY14 Steam System City Water Make-up Comparison**

### 3. Performance

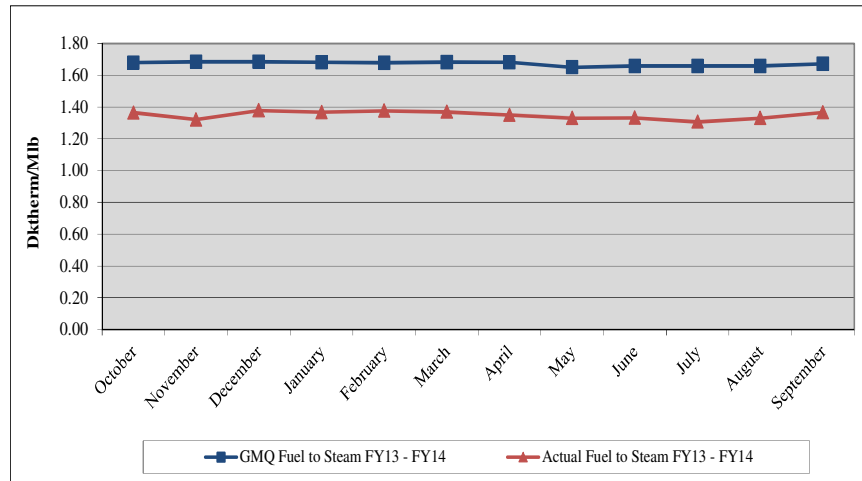
The performance of the steam system aspect of the EGF is presented by the following three charts, Figures 11, 12 and 13. Under the management of CNE, the System Performance Guarantee levels as described in the ARMA are being achieved satisfactorily.



**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 6.2% increase in the steam plant electric consumption while experiencing a 20% decrease in the electric conversion factor (due to an increase in steam sales). The water consumption for the steam plant decreased 64% 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 increased 3.8% for the current quarter due to an increase in the amount and temperature of the condensate return.

### 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 FY14 Production, Sales and Consumption Summary**

Item	Unit	First Quarter FY14	First Quarter FY13	*Percent Difference
	days	92	92	0.00%
<b>Total Electric Use</b>	kWhrs	20,457,250	20,132,909	1.61%
Chilled Water	kWhrs	20,297,215	19,982,256	1.58%
Steam	kWhrs	160,035	150,653	6.23%
<b>Total Water Use</b>	kgal	48,806	51,100	-4.49%
Total Chilled Water	kgal	47,725	48,088	-0.75%
EDS Make-up	kgal	3,551	2,882	23.21%
Cooling Towers	kgal	44,174	45,206	-2.28%
Calc CT Evaporation	kgal	39,041	38,194	2.22%
CT Blowdown	kgal	5,133	7,012	-26.80%
Calc # Cycles		7.61	5.45	39.64%
Steam	kgal	1,081	3,012	-64.11%
<b>Total Fuel Use</b>	mmBTU	83,408	74,016	12.69%
Natural Gas	mmBTU	83,400	74,016	12.68%
Propane	mmBTU	8	0	n.a.
<b>Condensate Return</b>	kgal	6,462	3,729	73.27%
	lbs	52,701,472	30,415,185	73.27%
Avg Temp	°F	175.0	169.0	3.55%
<b>Sendout</b>				
Chilled Water	tonhrs	25,456,900	23,472,000	8.46%
Steam	lbs	62,550,000	53,379,000	17.18%
Peak CHW Demand	tons	17,794	16,484	7.95%
Peak Steam Demand	lb/hr	52,000	59,844	-13.11%
CHW LF		64.79%	64.49%	0.47%
Steam LF		54.48%	40.40%	34.86%
<b>Sales</b>				
Chilled Water	tonhrs	23,791,965	22,711,341	4.76%
Steam	lbs	45,258,871	34,083,021	32.79%
<b>Losses</b>				
Chilled Water	tonhrs	1,664,935	760,659	118.88%
Steam	lbs	17,291,129	19,295,979	-10.39%
		27.64%	36.15%	-23.53%
<b>Degree Days</b>				
CDD		1,067	1,191	-10.41%
HDD		2	22	-90.91%

\*positive percent difference values imply an increase from FY13 to FY14

**Table 2. First Quarter FY14 Performance Guarantee Comparison for Steam and Chilled Water**

GMQ Calculations	Unit	First Quarter FY14	First Quarter FY13	*Percent Difference
<b>Steam</b>				
GMQ Elec Conversion	kWhr/Mlb	6.00	6.00	
Electric Conversion	kWhr/Mlb	3.54	4.42	-20.00%
GMQ Plant Efficiency	Dth/Mlb	1.663	1.725	
Plant Efficiency	Dth/Mlb	1.333	1.387	-3.83%
Actual %CR		84.25%	56.98%	47.87%
Avg CR Temp	°F	175	169	3.55%
GMQ Water Conversion	gal	1,388,673	3,237,969	
Water Conversion	gal	1,091,810	3,042,120	-64.11%
<b>Chilled Water</b>				
GMQ Elec Conversion	kWhr/tonhr	1.055	1.055	
Electric Conversion	kWhr/tonhr	0.853	0.880	-3.04%
GMQ Water Conversion	gal/tonhr	5.25	5.25	
Water Conversion	gal/tonhr	2.01	2.12	-5.26%

\*positive percent difference values imply an increase from FY13 to FY14

#### D. Operating Costs

The operating costs for the DES include the management fee to CNE, debt service payments on the bonds and engineering and administration costs. 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 FY14 to date are \$5,249,590. This value represents approximately 24.3% of the total budgeted operating cost for FY14 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 FY14 are \$5,217,021 which is approximately 26.5% of the budgeted amount.



The MFA transferred to date is \$489,575 (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	FY14 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	\$ 4,364,800	\$ 1,061,719	\$ -	\$ -	\$ -	\$ 1,061,719	24.32%
9th Chiller	\$ 40,500	\$ 9,949	\$ -	\$ -	\$ -	\$ 9,949	24.56%
C/O 6A	\$ 80,000	\$ 19,641	\$ -	\$ -	\$ -	\$ 19,641	24.55%
C/O 6B	\$ 70,100	\$ 17,195	\$ -	\$ -	\$ -	\$ 17,195	24.53%
C/O 7	\$ 28,100	\$ 6,478	\$ -	\$ -	\$ -	\$ 6,478	23.05%
C/O 8	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
Pass-thru Charges: Chemical Treatment	\$ 224,100	\$ 34,745	\$ -	\$ -	\$ -	\$ 34,745	15.50%
Insurance	\$ 30,300	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Marketing: CES Sales Activity	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Incentive Payments	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
FEA: Steam	\$ -	\$ 21,479	\$ -	\$ -	\$ -	\$ 21,479	n.a.
Chilled Water	\$ -	\$ 177,131	\$ -	\$ -	\$ -	\$ 177,131	n.a.
Misc: Metro Credit	\$ -	\$ (206,198)	\$ -	\$ -	\$ -	\$ (206,198)	n.a.
ARFA	\$ -	\$ 15,420	\$ -	\$ -	\$ -	\$ 15,420	n.a.
Deferral	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
<b>Subtotal - Man Fee =</b>	<b>\$ 4,837,900</b>	<b>\$ 1,157,558</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 1,157,558</b>	<b>23.93%</b>
<b>Reimbursed Management Fee + Chem Treatment</b>	<b>\$ 456,754</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 456,754</b>	<b>0.00%</b>
<b>Metro Costs</b>							
Pass-thru Charges: Engineering	\$ 10,100	\$ 112	\$ -	\$ -	\$ -	\$ 112	1.10%
EDS R&I Transfers	\$ 268,800	\$ 67,200	\$ -	\$ -	\$ -	\$ 67,200	25.00%
Metro Marketing	\$ 10,000	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Project Administration	\$ 17,500	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Metro Incremental Cost	\$ 530,200	\$ 145,251	\$ -	\$ -	\$ -	\$ 145,251	27.40%
Utility Costs: Water/Sewer	\$ 714,300	\$ 187,860	\$ -	\$ -	\$ -	\$ 187,860	26.30%
EDS Water/Sewer	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
EDS Electricity	\$ -	\$ 18,294	\$ -	\$ -	\$ -	\$ 18,294	n.a.
Electricity	\$ 6,585,000	\$ 2,176,926	\$ -	\$ -	\$ -	\$ 2,176,926	33.06%
Natural Gas Consultant	\$ 98,300	\$ 4,753	\$ -	\$ -	\$ -	\$ 4,753	4.83%
Natural Gas Transport	\$ -	\$ 41,347	\$ -	\$ -	\$ -	\$ 41,347	n.a.
Natural Gas Fuel	\$ 3,057,800	\$ 327,008	\$ -	\$ -	\$ -	\$ 327,008	10.69%
Propane	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
<b>Subtotal - Metro Costs =</b>	<b>\$ 11,292,000</b>	<b>\$ 2,968,750</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 2,968,750</b>	<b>26.29%</b>
<b>Subtotal - Operations =</b>	<b>\$ 16,129,900</b>	<b>\$ 4,126,307</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 4,126,307</b>	<b>25.58%</b>
<b>Debt Service</b>							
2012 Bonds	\$ 3,476,000	\$ 867,688	\$ -	\$ -	\$ -	\$ 867,688	24.96%
2005 Bonds	\$ 752,300	\$ 173,291	\$ -	\$ -	\$ -	\$ 173,291	23.03%
2007 Bonds	\$ 215,700	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
2008 Bonds	\$ 214,400	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
2010 Bonds	\$ 212,100	\$ 89,050	\$ -	\$ -	\$ -	\$ 89,050	41.99%
MCCC Fund	\$ 748,000	\$ -	\$ -	\$ -	\$ -	\$ -	
Interest Revenue	\$ (193,400)	\$ (6,747)	\$ -	\$ -	\$ -	\$ (6,747)	3.49%
MIP	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Oper. Reserve Fund	\$ 93,600	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
<b>Subtotal - Capital =</b>	<b>\$ 5,518,700</b>	<b>\$ 1,123,283</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 1,123,283</b>	<b>20.35%</b>
<b>Total =</b>	<b>\$ 21,648,600</b>	<b>\$ 5,249,590</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 5,249,590</b>	<b>24.25%</b>
<b>Customer Revenues</b>							
Taxes Collected	\$ 90,505	\$ 90,505	\$ -	\$ -	\$ -	\$ 90,505	n.a.
Taxes Paid	\$ 89,445	\$ 89,445	\$ -	\$ -	\$ -	\$ 89,445	n.a.
Penalty Revenues/Credits	\$ (39,129)	\$ (39,129)	\$ -	\$ -	\$ -	\$ (39,129)	n.a.
Energy Revenues Collected	\$ 5,255,091	\$ 5,255,091	\$ -	\$ -	\$ -	\$ 5,255,091	n.a.
<b>Revenues =</b>	<b>\$ 19,690,300</b>	<b>\$ 5,217,021</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 5,217,021</b>	<b>26.50%</b>
<b>Metro Funding Amount =</b>	<b>\$ 1,958,300</b>	<b>\$ 32,569</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 32,569</b>	<b>1.66%</b>

The DES serves 28 customers and 41 buildings in downtown Nashville, including the new Music City Convention Center (MCCC) and Nashville Hyatt Place. 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. For FY13, the MCCC is considered a Metro owned building even though the general contractor is

paying for temporary services. 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	\$ 1,121,340	6,474,476	\$ 0.1732	\$ 264,314	8,284	\$ 31.9073
State Government	\$ 1,101,152	6,033,735	\$ 0.1825	\$ 391,776	12,164	\$ 32.2080
Metro Government	\$ 1,846,572	11,283,754	\$ 0.1636	\$ 529,937	24,811	\$ 21.3588
New Customers	\$ 1,084,784	6,514,277	\$ 0.1665	\$ 268,645	16,220	\$ 16.5621
<b>Total</b>	<b>\$ 4,069,064</b>	<b>23,791,965</b>	<b>\$ 0.1710</b>	<b>\$ 1,186,027</b>	<b>45,259</b>	<b>\$ 26.2054</b>

Total Revenue \$ 5,255,091  
 True-up and Adjustments (Net) \$ (38,070)  
 Net Revenue \$ 5,217,021

### III. EGF Operations

Items relating to the facility operations presented herein are derived from the monthly reports issued by CNE for FY14. 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.

- In July, the chillers and pumped tripped offline on two separate occasions which caused the chilled water supply temperature to increase above 43°F. One trip was caused by an incoming electrical power issue related to the south NES substation. The other trip was caused by an internal communications issue with the CNE control system.
- 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 Bloodborne Pathogens, CPR and First Aid, and Confined Space Training.

CNE has begun cross-training 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 began 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 84.3% of the steam sendout during the quarter which represents a 48% increase over the previous First Quarter. This high percentage of condensate return is an excellent indicator of the quality of steam and condensate throughout the system.
  - The steam system make-up decreased significantly over the previous First Quarter.
- 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
  - The control of the system chemistry continues to be excellent.

#### 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.

- Work began on the bladder replacement for expansion tank #1.
- The boiler #3 O<sub>2</sub> analyzer was re-calibrated.
- Trane replaced solenoid valves and temperature sensors on several of the chillers as part of their PM program with CNE.
- The UPS on the softener controller was replaced.
- The backflow preventers were tested by Metro Water. All units passed.
- Fluorescent dye was placed into the chilled water system to assist in finding leaks in the EDS.
- 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 October 28, 2013, 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.
- The leak in expansion tank #2 has not been repaired, but the replacement bladder is on order.
- Some minor graffiti was found on the outer west wall of the EGF.
- A small water leak in a structural joint on cooling tower #17 was noted.
- 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 FY14 Open Projects

The following projects remained open at the end of the First Quarter FY14.

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.

2. DES077 – Music City Center Service Connection

This project will most likely be closed-out during the Second Quarter FY14.

3. DES080 – Misc. Manhole & Tunnel Safety Repairs

This project was closed during the First Quarter FY14.

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

Work associated with this project will be ongoing as required.

5. DES091 – Thermal Storage and NES Time of Use Rates

Although the thermal storage aspect of this project is completed, additional investigation is currently being performed by TEG for the conversion of the current billing practices to a time of use basis matching that of the electric invoice from NES.

6. DES 095 – Manhole B2 Water Infiltration Remediation

This project was closed during the First Quarter FY14.

7. DES 098 – Nashville Hyatt Place Customer Connection

Start-up of the chilled water and steam services began during the First Quarter FY14. An executed service agreement has been completed. The building is

anticipated to open to the public during the Second Quarter FY14. This project is expected to be closed-out in the Second Quarter FY14.

8. DES 100 – MH-10 Roof Replacement

Work on this project began during the First Quarter and was completed on schedule within one month. This project is expected to be closed-out in the Second Quarter FY14 upon final invoicing from CNE.

9. DES 101 – MH-1 Abandonment

This project is complete and will be closed-out during the Second Quarter FY14.

B. First Quarter FY14 Closed Projects

DES 080 Misc. Manhole & Tunnel Safety Repairs and DES 095 Manhole B2 Water Infiltration Remediation were closed during the First Quarter FY14.

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	FY14 Spending to Date	Total Spent to Date	Remaining Balance
<b>2010 Bond Projects</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	\$ 2,629	\$ 64,389	\$ 35,611
<b>Total Closed Projects</b>		<b>\$ 1,814,533</b>	<b>\$ -</b>	<b>\$ 1,814,533</b>	<b>\$ -</b>
	Metro Project Admin	\$ -	\$ -	\$ -	\$ -
	Project Man, Development, etc	\$ 444,467	\$ -	\$ -	\$ 444,467
<b>Total 2010 Bond</b>		<b>\$ 2,410,000</b>	<b>\$ 2,629</b>	<b>\$ 1,891,029</b>	<b>\$ 518,971</b>
<b>MCCC Construction Fund</b>					
DES077	Music City Convention Center Design/Const	\$ 545,900	\$ -	\$ 453,281	\$ 92,619
DES077	MCCC Metering	\$ 121,870	\$ 10	\$ 141,711	\$ (19,841)
DES077	Bell/Clark Construction Fund	\$ 4,697,860	\$ -	\$ 4,267,623	\$ 430,237
DES098	Nashville Hyatt Service Connection	\$ 300,000	\$ 737	\$ 250,294	\$ 49,706
DES100	MH-10 Roof Repair	\$ 450,000	\$ 1,785	\$ 5,323	\$ 444,677
DES101	MH-1 Abandonment	\$ 55,000	\$ 24,788	\$ 34,197	\$ 20,803
DES102	Customer Delta T Control Modifications	\$ 30,000	\$ -	\$ -	\$ 30,000
DES103	Sheraton Metering Modifications	\$ 60,000	\$ 11,952	\$ 11,952	\$ 48,048
<b>Sub-Total Closed Projects</b>		<b>\$ 686,197</b>	<b>\$ -</b>	<b>\$ 679,111</b>	<b>\$ 7,086</b>
	Metro Project Admin	\$ 50,000	\$ -	\$ 21,515	\$ 28,485
	Project Man, Development, etc	\$ 1,503,173	\$ -	\$ -	\$ 1,503,173
<b>Total MCCC Construction Fund</b>		<b>\$ 8,500,000</b>	<b>\$ 39,273</b>	<b>\$ 5,865,005</b>	<b>\$ 2,634,995</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 \$112,452. Table 6 provides a summary of the FY14 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	Market Adjustment	Market Value	Balance
Value at end of FY13						\$ -	\$ 51,892.81	\$ 51,892.81
N/A	8/14/2013	DES-1700	CNE	\$ 11,540.17				
N/A	8/14/2013	DES-1705	CNE	\$ 8,825.00				
N/A	9/3/2013	N/A	CNE	\$ 2,700.72				
July R&I Services	9/23/2013	N/A	CNE	\$ 5,974.59				
				<b>Sub-Total First Quarter</b>	<b>\$ 29,040.48</b>	<b>\$ 67,200.00</b>	<b>\$ -</b>	<b>\$ 38,159.52</b>
				<b>Sub-Total Second Quarter</b>	<b>\$ -</b>	<b>\$ 22,400.00</b>	<b>\$ -</b>	<b>\$ 22,400.00</b>
				<b>Sub-Total Third Quarter</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
				<b>Sub-Total Fourth Quarter</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
				<b>FY14 Year to Date</b>	<b>\$ 29,040.48</b>	<b>\$ 89,600.00</b>	<b>\$ -</b>	<b>\$ 112,452.33</b>

### 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. A more detailed review of the condition of the EDS is presented in subsection D of this report, "EDS Walk-through."

1. EDS Tunnel and Manhole Inspections
  - a. Manhole S5 (State system) required pumping numerous times during the quarter.
  - b. Water accumulation in Manhole B2 is reduced, however it required pumping several times during the quarter.
  - c. There are several lights in the 4<sup>th</sup> Avenue, 7<sup>th</sup> Avenue and Broadway Tunnels that are not working and need to be repaired.
  - d. There are several traps which are not functioning properly that CNE needs to repair.
  - e. Structural metal in the vaults and tunnels need to be cleaned and painted.
2. State Tunnel Inspections
  - a. CNE continues to monitor some minor steam and condensate leaks within the tunnel.

- b. Other minor repairs were made during the quarter.
3. Other EDS Inspections
  - a. The monthly thermographic analyses revealed no changes in the new hot spot at 1<sup>st</sup> and Molloy Street. No reported changes to the other hot spots.
  - b. Other minor items are included in the CNE monthly reports.

C. Emergencies

No emergencies were reported during the quarter.

D. EDS Walk-through

The First Quarter 2014 EDS walkthrough was conducted on October 22, 23 and 24, 2013, by Jon B. Belcher, PE. The manholes and tunnels that were visited included Manholes 2, 3, 4, 5, 6, 9, 10, 11, 13, 18A, D, the AA Birch Tunnel, the State Tunnel, 4<sup>th</sup> Avenue Tunnel, 7<sup>th</sup> Avenue Tunnel and the Broadway Tunnel. The following comments and observations are a result of these visits:

1. Manhole 2
  - a. There was a small amount of water present in this manhole and it required pumping before entry.
  - b. Due to the abandonment of Manhole 1 (DES 101), the anchors and slip joints in Manhole 2 have been removed and the only serviceable item in this manhole is a trap and its associated piping. Spalled concrete repairs were made under DES 101 along with the installation of a new ladder.
  - c. There were no deficiencies found.
2. Manhole 3
  - a. There was water present in this vault and it required pumping prior to entry.
  - b. There are some hairline cracks in the concrete walls that should be monitored.
  - c. There is some minor debris in the manhole which should be removed.
  - d. There are some minor insulation lagging repairs which should be made the next time that manhole insulation repairs are scheduled.
3. Manhole 4
  - a. There was water present in this manhole and it required pumping before entry.
  - b. The paint on the entry ladder is peeling off. The ladder should be cleaned and re-painted before corrosion requires the replacement of the ladder. CNE should coordinate this with TEG.

- c. The manhole vent is located directly above a steam pipe kicker/anchor. Because of this, rainwater drips directly onto this kicker/anchor. Flashing should be installed below the vent penetration and above the kicker to divert rainwater. CNE should coordinate this with TEG.
4. Manhole 5
  - a. There was water present in this manhole and it required pumping before entry.
  - b. There are some minor insulation lagging repairs which should be made the next time that manhole insulation repairs are scheduled.
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 has gotten worst since the last review. TEG will coordinate repairs with CNE.
6. Manhole 9
  - a. There was a small amount of water (~ 1") in the manhole based on the float set point of the sump pump. The sump pump was operational. CNE personnel should lower this set point slightly if possible to remove all water from the floor area.
  - b. There is some corrosion on some of the piping supports and some of the paint is starting to flake off. These places should be cleaned, prepped and re-painted. TEG will coordinate this with CNE.
  - c. There has been some water seepage around the linkseals for the water line which passes through this manhole. The linkseals should be adjusted/tightened and monitored.
7. Manhole 10
  - a. There was a minor amount of water present in this manhole due to the slope of the floor.
  - b. This manhole was just recently rebuilt with the removal and re-installation of a new roof; removal/rehabilitation of structural components; installation of an electric sump pump (with power from St. Mary's); installation of a new ladder; replacement of a steam slip joint and all piping was re-insulated.
  - c. The handwheel for the steam isolation valve that serves the Municipal Auditorium is absent. While in the manhole, CNE personnel cut the hub off of the stem and a new handwheel was ordered that afternoon. CNE personnel should install the new handwheel as soon as possible.
  - d. The steam service branch for St. Mary's consists of a vertical section of piping that includes two gate valves with a tee and drain between them. These valves should not be installed in a vertical position on a steam line; condensate can accumulate above the top

- valve and some condensate can accumulate above the bottom valve. The vertical piping is also out of plumb. At the earliest convenience, an isolation valve should be added to the horizontal section of piping and the handwheels removed from the two vertical valves so that they cannot be used. Then, when the next shutdown occurs for the piping in this manhole, the vertical valves should be replaced with piping. TEG will coordinate this work with CNE.
- e. The drain valve located between the two vertical valves cited in item 7.d. above is leaking. A threaded plug should be added to this drain line.
  - f. Even though the manhole was just rebuilt, it was unusually warm. The leaking drain in item 7.e. is probably contributing to this heat gain. CNE should monitor this, especially after the drain valve is plugged.
8. Manhole 11
- a. There was water in this manhole which required pumping before entry.
  - b. The entry ladder consists of individual ladder rungs embedded into the concrete walls. This type of ladder rung can fail without warning and could result in personal injury. These rungs should be removed from the walls and a new ladder installed. TEG will coordinate this with CNE.
  - c. There is some moderate corrosion in this manhole. This manhole is a “Moderate” priority on the “MH & Tunnel Structural Corrosion Prevention/Repair”.
9. Manhole 13
- a. There was a small amount of water present in this manhole and it required pumping before entry.
  - b. The insulation jacketing at the very bottom of the dripleg is coming off. This should be repaired the next time manhole insulation repairs are scheduled.
  - c. The Teflon pads on the kicker slide plates have fallen out of place. During the next shut-down of this section of piping, these pads should be re-positioned and a method devised to keep them in their proper position.
  - d. There is some moderate corrosion in this manhole. This manhole is a “Moderate” priority on the “MH & Tunnel Structural Corrosion Prevention/Repair”.
  - e. There are several locations where concrete has spalled from the ceiling and concrete beams in the manhole and should be repaired. TEG is developing a methodology for this to be repaired.



10. Manhole 18A
  - a. There was water present in the manhole and was pumped prior to entry.
  - b. There is some very minor corrosion on the structural metal components in this manhole. This corrosion should be cleaned and painted to prevent its propagation.
11. Manhole D
  - a. There was a minor amount of 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 is developing a methodology for this to be repaired.
  - 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. Severe water hammer was present in the manhole and it appears that it is due to excessive condensate in the steam piping. The trap bucket was replaced with two new buckets during this review and the hammering did not cease. Similar hammering was found in the AA Birch tunnel nearby. CNE should drain any excess condensate from the steam piping to try and alleviate the hammering. The existing “sparge” station may need to be replaced in this manhole in order to reduce/eliminate this hammering.
12. Manhole D Sump
  - a. No deficiencies to report.
13. AA Birch Tunnel
  - a. There are several locations throughout the tunnel which groundwater is entering the tunnel. This infiltration could result in detrimental effects to the tunnel’s structural integrity. These tunnel sections have been evaluated by TEG’s structural engineer and a solution has been designed. TEG will assemble a bid package to obtain bids for this work and coordinate it with CNE.
  - b. The trap at the east end of the tunnel is experiencing severe water hammer. CNE should drain any excess condensate from the steam piping to try and alleviate the hammering. It may be necessary to add a sparge tube to this location.
  - c. A chilled water vent valve in the upper area of the east end of the tunnel appears to be leaking; there is water on “top” of the vertical

- valve. CNE should investigate if this valve needs to be replaced. All of the vents and drains should have caps installed.
14. State Tunnel
- a. There are several lights not working throughout the tunnel. CNE should inform the State and have them replace them.
  - b. Several of the support C Channels have minor to moderate corrosion. This should be brought to the attention of the State for remediation.
  - c. There are several locations, the concrete tunnel structure has some minor to moderate cracking, spalling, exposed rusty rebar and/or shifting of roof structures. These problems exist at the following locations within the tunnel: N5, N7, N20, N31, N39, N47, N54, N61, N62, W42, W43, W44, W56, W59, W62, W75, E19, E26, E47, E51, E62, E66 and E69. The state should be informed of these deficiencies. If requested by the State, TEG could arrange to have our structural engineer review these deficiencies with them.
  - d. The steam valve at W57 is leaking at the stem. CNE should repair this leak.
  - e. There is a pin hole leak on a high pressure condensate joint at Column W74. This leak should be repaired.
  - f. There is some mud and debris at the intersection of the west and north tunnel branches; this debris and mud should be removed from the tunnel.
  - g. At location N20, the spider portion of the high pressure condensate pipe had slid out of the outer guide and was not bolted tightly to the pipe. The spider was re-positioned in the guide during the walkthrough, but CNE personnel need to tighten this spider and check the tightness/position of all of the other spiders in the tunnel.
  - h. There is a slight steam leak on the steam expansion joint at location E44. This leak should be monitored until it is substantial enough to be repaired.
  - i. At location E26, the spider portion of the low pressure condensate pipe is loose. CNE personnel need to tighten this spider and check the tightness/position of all of the other spiders in the tunnel.
  - j. There is a lot of debris at location E2 that should be removed whether it is the State's responsibility or MNDES.
  - k. The concrete roof at the southern end of the east tunnel is spalling badly and probably requires replacement. CNE should bring this issue to the State's attention.
15. Manhole 23
- a. Water is present in the entry area of this manhole; the drains need to be cleaned again.

- b. There is some moderate corrosion in this manhole. This manhole is a “Moderate” priority on the “MH & Tunnel Structural Corrosion Prevention/Repair”.
  - c. The drain valve on the dripleg is leaking and needs to be repaired.
  - d. The insulation on the lower portion of the dripleg is absent from a prior repair. This insulation should be replaced the next time manhole insulation repairs are done.
16. 7<sup>th</sup> Avenue Tunnel
- a. There is minor corrosion on structural steel location 7-81. This is a “Low” priority on the “MH & Tunnel Structural Corrosion Prevention/Repair”.
  - b. The dripleg trap isolation valve is leaking at the valve stem. CNE needs to repair this valve.
  - c. There are lights not working at locations 7-34 and 7-48; CNE should repair these lights.
  - d. The slide/guide at location 7-44 is severely corroded and needs to be replaced. CNE should check all of the piping guides/slides to determine their condition. TEG will coordinate these repairs with CNE.
  - e. There is corrosion on the structural piping supports at the Hume Fogg service connection (location 7-11). This area is a “High” priority on the “MH & Tunnel Structural Corrosion Prevention/Repair”.
  - f. One of the chilled water service valves at this location is not insulated. This valve should be insulated the next time manhole/tunnel insulation repairs are done.
  - g. There is a lot of insulation and lagging debris at the bottom of the Hume Fogg vertical service shaft. This debris needs to be removed and the area cleaned.
  - h. There is groundwater dripping onto the piping in this vertical shaft which has penetrated the insulation/lagging of some of the piping. This has caused corrosion of the piping in this area. The piping in this shaft should be re-insulated and sealed to prevent groundwater infiltration; however the access to this shaft to perform this work is very limited. CNE personnel should meet with an insulator to determine the viability of having this piping re-insulated.
17. 4<sup>th</sup> Avenue Tunnel
- a. There are lights not working at locations 4-9, 4-46, 4-49, 4-52, 4-55, 4-56, 4-67, 4-74 and 4-84; CNE should repair these lights.
  - b. The steam valve insulation blanket at location 4-14 is in poor condition and partially removed from the valve. This blanket should be replaced the next time manhole/tunnel insulation repairs are done.

- c. At location 4-17, the valve upstream of the trap appears to have been “shot” to repair a leak; however it does not appear that this valve is usable to check trap operation. In addition, the strainer upstream of the trap appears to be clogged. This valve (trap assembly?) should be replaced during the next service shut down.
  - d. The steam expansion joints at locations 4-45 and 4-62 are leaking. CNE should continue to monitor these joints and have them sealed when the leaks progress enough to allow the sealing to hold.
  - e. The steam isolation valve at location 4-62 (Suntrust service) is leaking at the stem packing. CNE should repair this valve.
  - f. The trap at location 4-62 is blowing through; CNE should make the necessary repairs/replacement to this trap.
  - g. The trap at location 4-79 is not cycling normally. CNE should make the necessary repairs/replacement to this trap.
18. **Broadway Tunnel**
- a. The steam expansion joints at locations B-82 and B-65 are leaking. CNE should continue to monitor these joints and have them sealed when the leaks progress enough to allow the sealing to hold.
  - b. The slip joint support structure/table at location B-65 is badly corroded. TEG will coordinate with CNE to investigate a repair procedure for this support.
  - c. There is a lot of insulation, lagging and other debris in the Bridgestone arena tunnel. CNE should remove all of this debris.
  - d. The trap at location B-50 is not functioning properly. CNE should make the necessary repairs/replacement to this trap.
  - e. The trap line at location B-19 is plugged. CNE should make the necessary repairs to this trap line.
  - f. There is some minor debris in Manhole 18 that should be removed.

## **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, including the Music City Center and Nashville Hyatt Place. 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 additional marketing at this time due to the uncertainty of the actual steam and chilled water loads on the MCC.

## 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.
- The chilled water at the Sheraton Hotel was placed into a bypass mode around the existing heat exchanger and metering equipment for a few days in July.
- CNE and TEG met with building personnel from the MCC to discuss their steam and chilled water usages and operations.
- Repairs to the 2" steam meter and the chilled water RTD's were made at the MCC during July.
- CNE and TEG personnel met with Viridian building personnel to discuss cooling issues in their building.
- Work at several of the State of TN buildings was coordinated with CNE and the respective contractors and building personnel.
- Chilled water issues with the operation of the chilled water pump at Wells Fargo were discovered during the quarter and presented to TEG and the building owner for review. A resolution to these issues was determined during the quarter and is expected to be implemented by the building owner in the Second Quarter.
- A steam outage occurred in September for the State steam loop and a few additional customers so that work on MH-10 (DES-100) could be completed. Steam was restored as scheduled.
- 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 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.
- Steam traps which need repair or replacement should be addressed as soon as possible.
- Tunnel lighting should be repaired as soon as possible.