



## **Operations Monitoring Report**

**Fourth Quarter FY19**

**Prepared by:**

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## I. Executive Summary

A review of the fiscal year 2019 (FY19) Fourth Quarter performance and contract obligations between Constellation New Energy (CNE) and the Metropolitan Government of Nashville and Davidson County (Metro) is presented in this report by Thermal Engineering Group, Inc. (TEG). The status of the available funds for all active capital construction and repair and improvement projects are also presented. For the fiscal year 2019 to date, CNE has met all of the contract obligations to Metro and has had no contract violations.

As a response to the solicitation of bids for the Implementation Scenarios for Metro's DES Program Options (RFQ#1044673), Metro issued their intention to award Engie Development, LLC on March 22, 2019. The proposal from this bidder included the purchase of the Metro DES for \$60,000,000. The award is contingent upon successful contract negotiations. During the Fourth Quarter, Engie proceeded to obtain the necessary consents for the sale from the DES customers. All of the customer consents have been provided as of the date of this report.

For the Fourth Quarter FY19, the chilled water sales decreased 7.1% over the previous Fourth Quarter (FY18). The chilled water sendout also decreased 5.8% over the previous Fourth Quarter. The system losses increased approximately 29.61%. The number of cooling degree days decreased over the previous Fourth Quarter by approximately 12%. The peak chilled water demand for the current quarter was 15,771 tons, which is 9.4% lower than the previous Fourth Quarter.

For the fiscal year, chilled water sales increased 3.4% over the previous fiscal year (FY18). Sendout increased 2.8% over the previous fiscal year. The system losses decreased over FY19 by 9.1%. The number of cooling degree days have increased by approximately 7% over FY18. The peak chilled water demand for FY19 was 18,185 tons which is 2.2% greater than in FY18.

Steam sendout for the current quarter decreased by approximately 5.3% over the previous Fourth Quarter with a 44.6% decrease in heating degree days. Likewise, steam sales also decreased by approximately 10.5% over the previous Fourth Quarter. Total steam system losses increased by 15.4% over the previous Fourth Quarter. The peak steam demand for the current quarter was 100,906 pounds per hour, which represents an increase in the Fourth Quarter demand by approximately 5.7%.

For the fiscal year, steam sendout increased by 2.9% over the previous fiscal year with a 4.9% decrease in heating degree days. Steam sales also increased over the previous fiscal year by approximately 3.4%. Total steam system losses remained approximately the same as the previous fiscal year. The peak steam demand for the fiscal year was 142,594 pounds per hour, which represents a decrease in demand by approximately 5.3%.

The EGF performance continues to satisfactorily meet the System Performance Guarantee (Guaranteed Maximum Quantity or GMQ) levels. The chilled water plant electric consumption per unit of sales continues to perform lower than the guaranteed levels for the quarter. Total chiller plant electric usage decreased 7.0% from the previous Fourth Quarter and the unit electric

consumption was marginally higher than in the previous Fourth Quarter. The steam plant electric consumption per unit of sales decreased over the previous Fourth Quarter by 3.5%. The total water consumption for the steam and chilled water plants increased 3.5% from the previous Fourth Quarter. The steam plant water usage increased by 58.6% for the quarter.

The unit electric consumption for the chiller increased approximately 1.0% this fiscal year compared to the previous fiscal year. The unit water usage for the chiller plant remained approximately the same as the previous fiscal year.

For the fiscal year, the unit electric consumption for the steam plant increased 4.3% while the plant fuel efficiency remained approximately the same. The steam plant water usage increased by 28% compared to the previous fiscal year.

Work continued on DES Capital and Repair & Improvement Projects during the Fourth Quarter. Repair and Improvements to the EDS continue as scheduled. DES133.1, DES135, DES139, DES152, DES153, DES154, DES157, DES158, DES159, DES160, DES161, DES162, DES163, DES168 and DES169 are ongoing. Design completion and bidding are anticipated for DES153, DES157, DES159, DES161, DES162 and DES169 during the First Quarter FY20.

DES151, DES164, DES165 and DES166 were closed during the Fourth Quarter FY19.

The current fiscal year system operating costs to date are \$19,462,013. This value represents approximately 94% of the total budgeted operating cost for FY19. The customer revenues from the sales of steam and chilled water for FY19 (to date) are \$17,825,870 which is approximately 93% 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 FY19 is \$1,640,300 (100% of budget). However, the actual MFA required cannot be accurately calculated due to outstanding invoices as of the date of this report.

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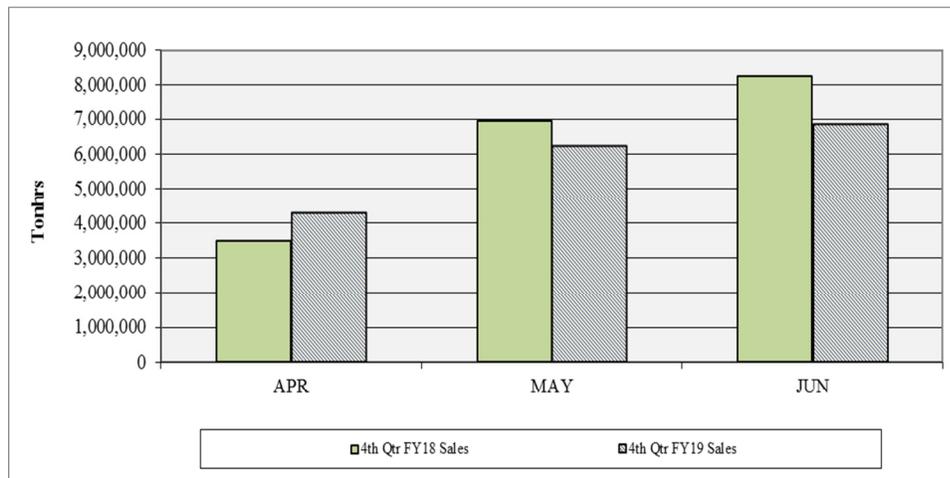
## II. Energy Distribution Sales and Performance

### A. Chilled Water

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

#### 1. Sales and Sendout

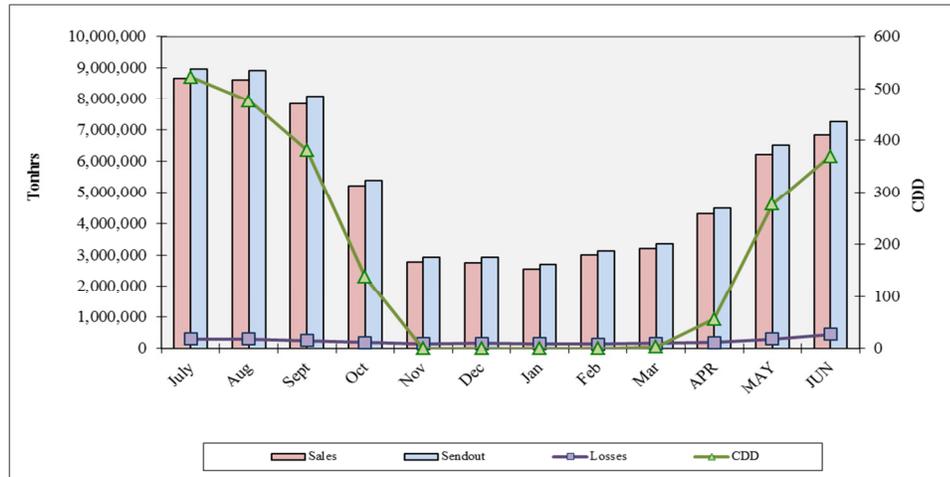
A comparison for the Fourth Quarter chilled water sales is shown in Figure 1. This data reflects a 7.1% decrease in sales for the current quarter over the same quarter of the previous fiscal year.



**Figure 1. Chilled Water Sales Comparison**

The peak chilled water demand for the current quarter was 15,771 tons, which represents a 9.4% decrease over the previous Fourth Quarter.

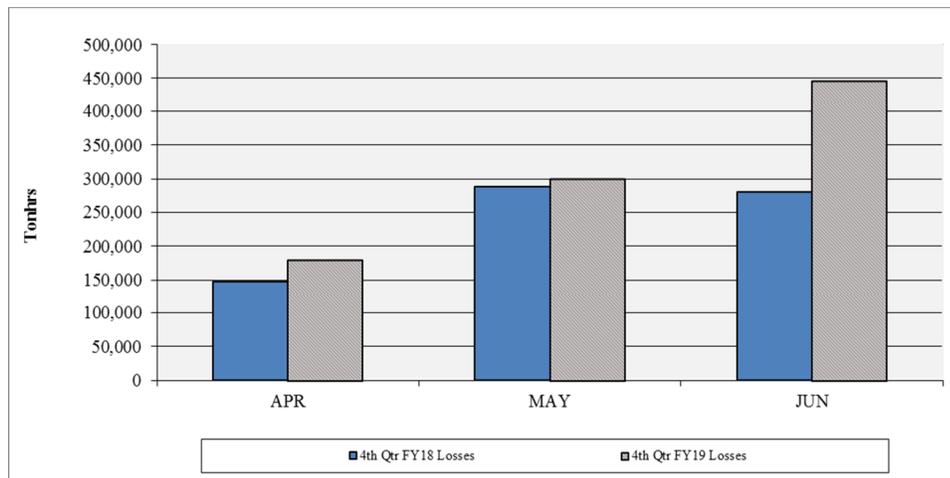
Figure 2 shows the chilled water sales, sendout and losses for the previous twelve months. The losses on this figure are defined as the difference in tonhrs per month between the recorded sendout and sales values and represent the total energy loss for chilled water in the EDS. The number of cooling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



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

2. Losses

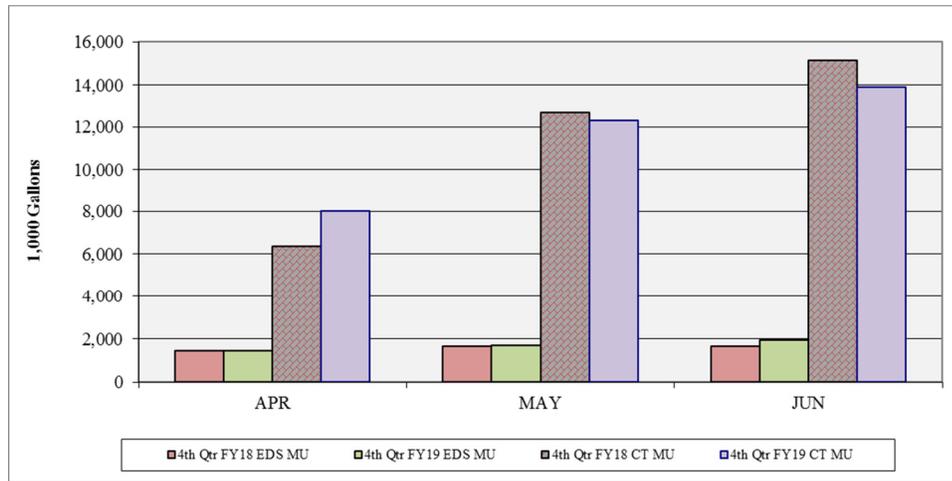
A comparison of the total, chilled water energy losses in the EDS for the Fourth Quarter is shown in Figure 3. These losses are the difference in chilled water sendout and sales.



**Figure 3. Chilled Water System Loss Comparison**

The EDS make-up increased by 5.9% over the previous Fourth Quarter. Although several chilled water leaks within the EDS have been found resulting in a decrease in make-up, additional leaks may have formed in recent months. A new leak was found and repaired in the vicinity of 5<sup>th</sup> Ave N and Union St but additional leaks are suspected. TEG and CNE are still investigating the sources of the leaks.

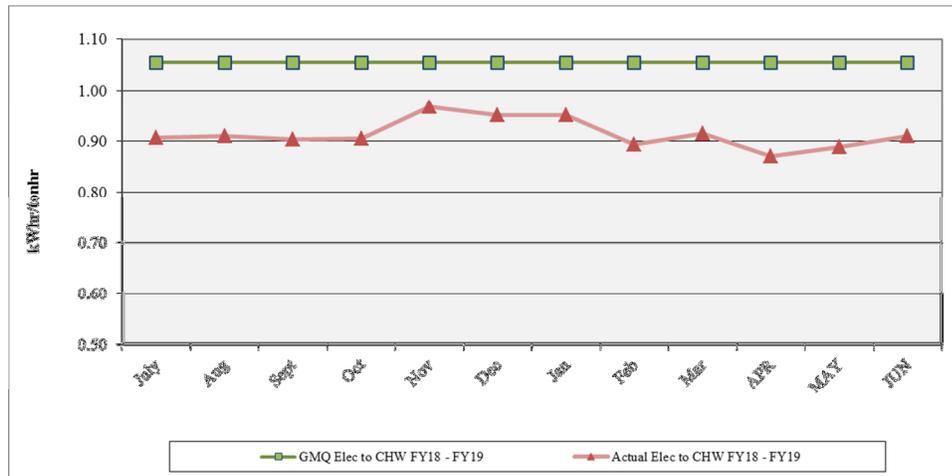
The make-up to the cooling towers remained approximately the same as in the previous Fourth Quarter. The number of cycles of concentration in the condensing water circuit increased 34.3%. This decrease may be due to reporting errors associated with malfunctioning equipment on the cooling tower blowdown system during the quarter. This equipment has since been repaired. The overall city water make-up comparison for the chilled water system is shown in Figure 4.



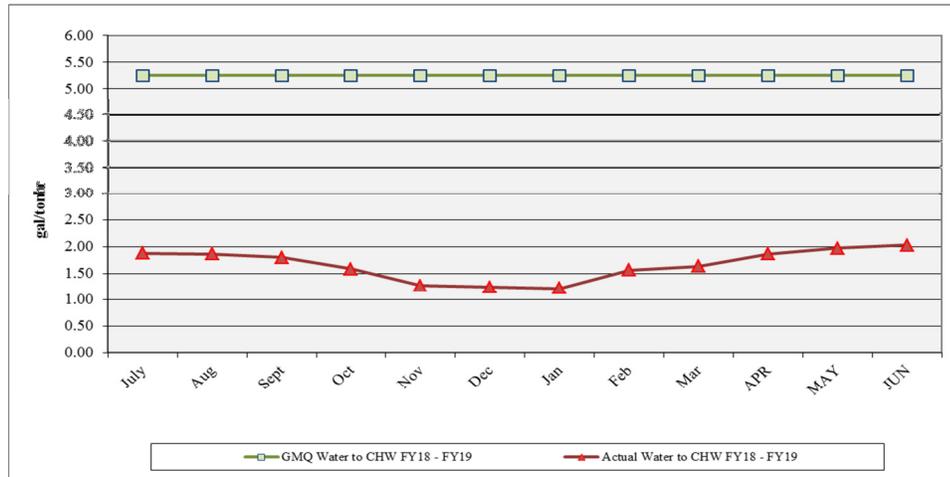
**Figure 4. Chilled Water System City Water Usage Comparison**

### 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.



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



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

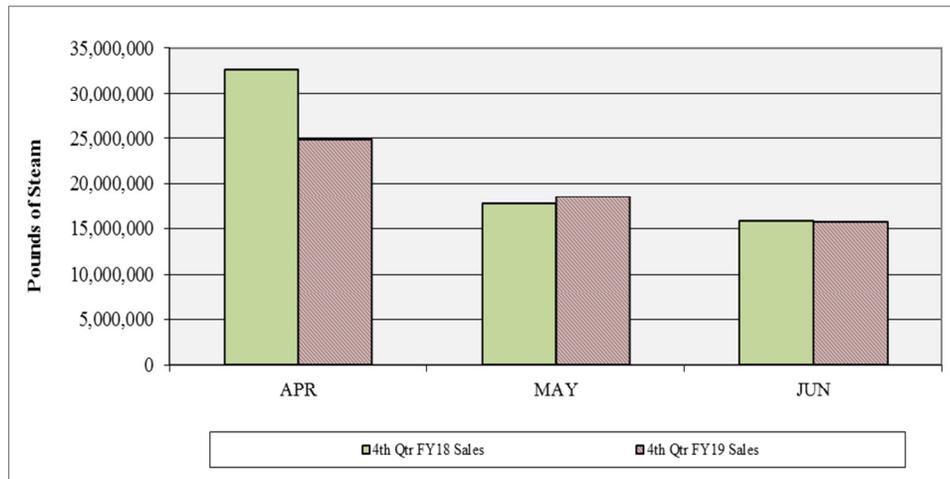
The chilled water allocation of the electric consumption falls under the GMQ limit of 1.055 kWhr per tonhr for the current quarter, and no excursion is reported for the current fiscal year. The electric usage per unit of sales increased marginally over the previous Fourth Quarter; however when compared to the historic data, the trend reveals an increasing electric usage per unit of sales (kWhr per tonhr). CNE and TEG have had several conversations regarding this issue within the past year and TEG does not believe that CNE has adequately addressed this issue which TEG believes may be related to the performance and condition of the cooling towers or the operation of the chiller plant.

The total consumption of city water for the chiller plant for the current quarter has increased by less than 1%.

**B. Steam**

**1. Sales and Sendout**

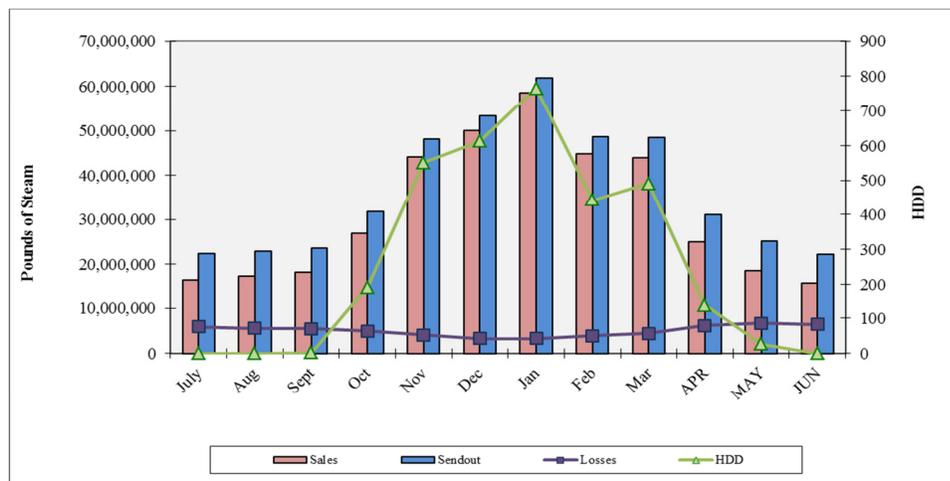
The steam sendout decreased by approximately 5.3% over the previous Fourth Quarter (FY18), and the sales also decreased by approximately 10.5%. The Quarter experienced a 44.6% decrease in the number of heating degree days. The steam system losses increased 15.4% over the previous Fourth Quarter. A comparison for the Fourth Quarter steam sales is shown in Figure 7.



**Figure 7. Steam Sales Comparison**

The peak steam demand for the current quarter was 100,906 pph, which reflects an approximate 5.7% increase in the peak steam production over the previous Fourth Quarter.

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

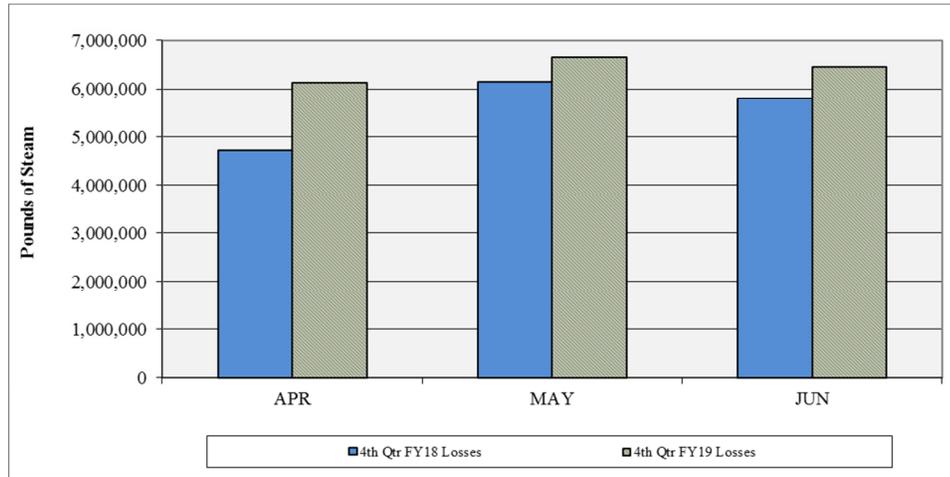


**Figure 8. Steam Sales, Sendout, Losses and HDD for the Previous Twelve Months**

## 2. Losses

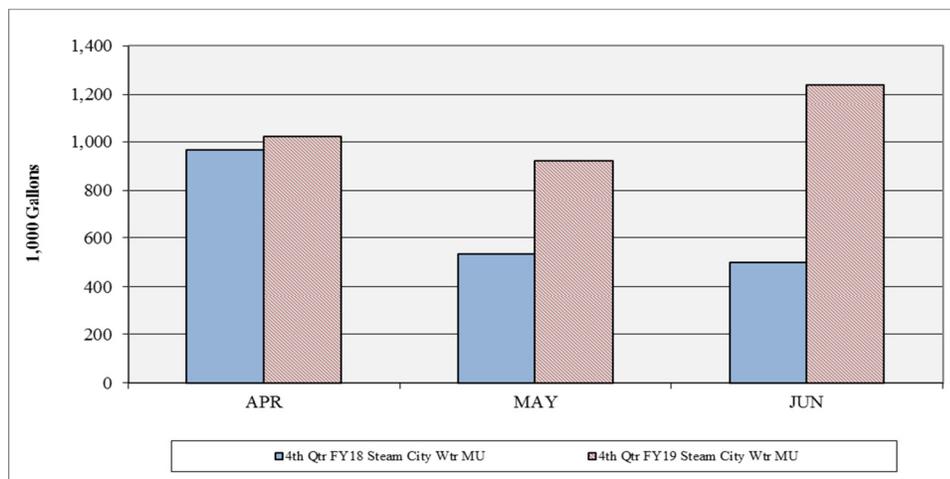
A comparison of the total steam mass losses in the EDS for the Fourth Quarter is shown in Figure 9. The mass loss is caused by the heat loss in the EDS between the EGF and the customer meters, resulting in a mass loss at steam traps. Faulty

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



**Figure 9. Steam System Losses**

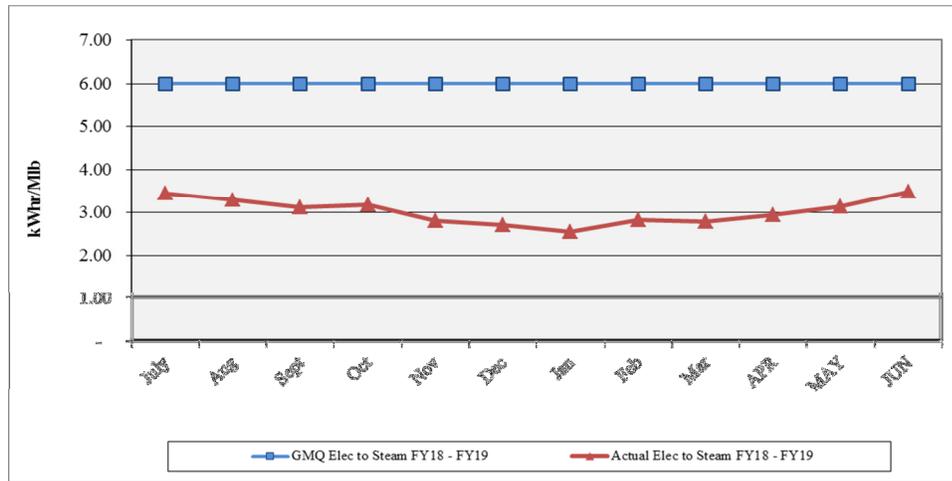
The amount of city water make-up (MU) to the steam system consists of the loss in mass between the EGF and the customers, in the condensate return from the customers to the EGF and losses at the EGF. The amount of condensate return decreased during the Fourth Quarter due to the mechanical and operational issues at several of the customer buildings. These issues have been repaired or are expected to be repaired soon. This data is shown in the comparison of Fourth Quarter data in Figure 10.



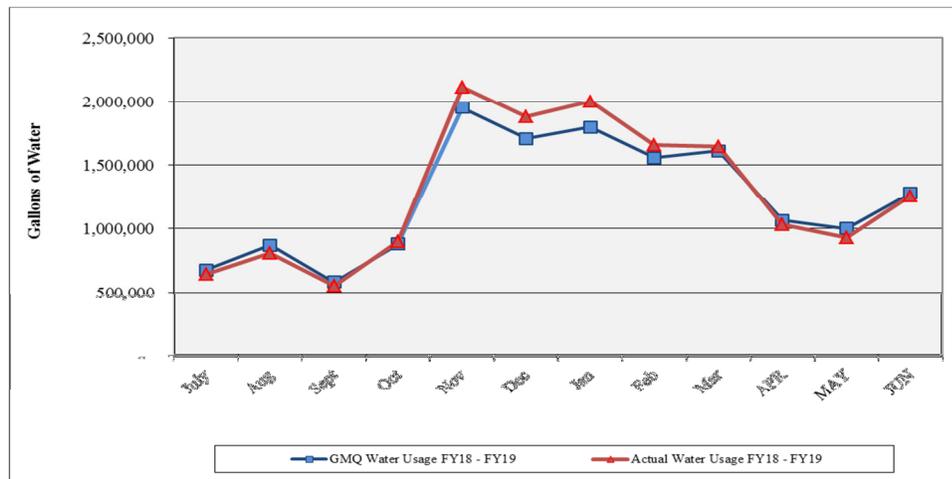
**Figure 10. Steam System City Water Make-up Comparison**

### 3. Performance

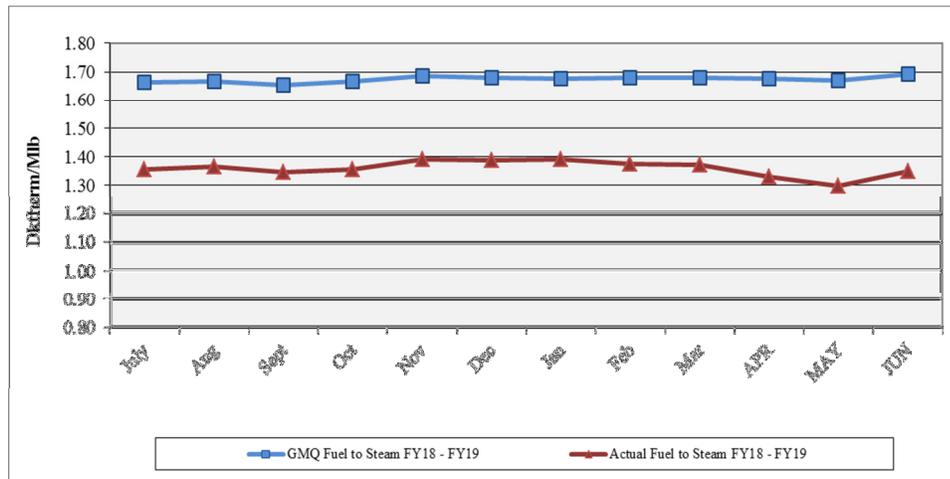
The performance of the steam system of the EGF is presented by the following three charts, Figures 11, 12 and 13. Under the management of CNE, the System Performance Guarantee levels as described in the ARMA are being achieved satisfactorily.



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



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



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

The current quarter experienced a 3.5% decrease in the steam plant electric consumption while experiencing a 7.8% increase in the electric conversion factor. The water consumption for the steam plant increased 58.6% this quarter as compared to the previous Fourth Quarter. The fuel consumption per unit of steam sales was 2.6% lower than in the previous Fourth Quarter.

C. Contract Guarantee Performance

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

**Table 1. Fourth Quarter FY19 and Annual Production, Sales and Consumption Summary**

Item	Unit	Fourth Quarter FY19	Fourth Quarter FY18	*Percent Difference	Total Year FY19	Total Year FY18	*Percent Difference
	days	91	91	0.00%	365	365	0.00%
<b>Total Electric Use</b>	kWhrs	15,652,685	16,821,677	-6.95%	57,417,435	54,962,006	4.47%
Chilled Water	kWhrs	15,466,901	16,629,150	-6.99%	56,322,467	53,946,798	4.40%
Steam	kWhrs	185,784	192,527	-3.50%	1,094,968	1,015,208	7.86%
<b>Total Water Use</b>	kgal	42,427	40,988	3.51%	146,808	138,944	5.66%
Total Chilled Water	kgal	39,250	38,985	0.68%	131,568	127,040	3.56%
EDS Make-up	kgal	5,073	4,789	5.93%	22,602	26,228	-13.82%
Cooling Towers	kgal	34,177	34,196	-0.06%	108,966	100,812	8.09%
Calc CT Evaporation	kgal	30,543	29,485	3.59%	92,943	85,626	8.55%
CT Blowdown	kgal	3,634	4,711	-22.86%	16,023	15,186	5.51%
Calc # Cycles		8.40	6.26	34.29%	5.80	5.64	2.88%
Steam	kgal	3,177	2,003	58.61%	15,240	11,904	28.02%
<b>Total Fuel Use</b>	mmBTU	103,883	112,634	-7.77%	601,143	583,510	3.02%
Natural Gas	mmBTU	103,875	112,634	-7.78%	600,771	583,411	2.98%
Propane	mmBTU	8	0	0.00%	372	99	275.76%
<b>Condensate Return</b>	kgal	6,715	8,259	-18.70%	40,881	41,585	-1.69%
	lbs	54,763,270	67,360,796	-18.70%	333,420,119	339,158,575	-1.69%
Avg Temp	°F	190.3	184.0	3.44%	182.8	181.7	0.60%
<b>Sendout</b>							
Chilled Water	tonhrs	18,262,300	19,380,000	-5.77%	64,693,500	62,904,100	2.84%
Steam	lbs	78,401,000	82,770,000	-5.28%	439,458,000	427,398,000	2.82%
Peak CHW Demand	tons	15,771	17,408	-9.40%	18,185	17,800	2.16%
Peak Steam Demand	lb/hr	100,906	95,500	5.66%	142,594	150,565	-5.29%
CHW LF		53.02%	50.97%	4.01%	40.61%	40.34%	0.67%
Steam LF		35.58%	39.68%	-10.35%	35.18%	32.40%	8.57%
<b>Sales</b>							
Chilled Water	tonhrs	17,333,938	18,663,706	-7.12%	61,977,080	59,914,456	3.44%
Steam	lbs	59,170,565	66,098,969	-10.48%	379,380,218	366,927,696	3.39%
<b>Losses</b>							
Chilled Water	tonhrs	928,362	716,294	29.61%	2,716,420	2,989,644	-9.14%
Steam	lbs	19,230,435	16,671,031	15.35%	60,077,782	60,470,304	-0.65%
		24.53%	20.14%	21.78%			
<b>Degree Days</b>							
CDD		702	795	-11.70%	2,223	2,078	6.98%
HDD		164	296	-44.59%	3,220	3,387	-4.93%

\*positive percent difference values imply an increase from FY18 to FY19

**Table 2. Fourth Quarter FY19 and Annual Performance Guarantee Comparison for Steam and Chilled Water**

GMQ Calculations	Unit	Fourth Quarter FY19	Fourth Quarter FY18	*Percent Difference	Total Year FY19	Total Year FY18	*Percent Difference
<b>Steam</b>							
GMQ Elec Conversion	kWhr/Mlb	6.00	6.00		6.00	6.00	
Electric Conversion	kWhr/Mlb	3.14	2.91	7.80%	2.89	2.77	4.32%
GMQ Plant Efficiency	Dth/Mlb	1.679	1.659		1.674	1.667	
Plant Efficiency	Dth/Mlb	1.325	1.361	-2.63%	1.368	1.365	0.19%
Actual %CR		69.85%	81.38%	-14.17%	75.87%	79.35%	-4.39%
Avg CR Temp	°F	190	184	3.44%	183	182	0.60%
GMQ Water Conversion	gal	3,332,993	2,172,745		14,951,668	12,442,031	
Water Conversion	gal	3,208,770	2,023,030	58.61%	15,392,400	12,023,040	28.02%
<b>Chilled Water</b>							
GMQ Elec Conversion	kWhr/tonhr	1.055	1.055		1.055	1.055	
Electric Conversion	kWhr/tonhr	0.892	0.891	0.15%	0.909	0.900	0.93%
GMQ Water Conversion	gal/tonhr	5.25	5.25		5.25	5.25	
Water Conversion	gal/tonhr	2.26	2.09	8.40%	2.12	2.12	0.12%

\*positive percent difference values imply an increase from FY18 to FY19

#### D. Operating Costs

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

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

The current fiscal year system operating costs to date are \$19,462,013. This value represents approximately 94% of the total budgeted operating cost for FY19. The customer revenues from the sales of steam and chilled water for FY19 (to date) are \$17,825,870 which is approximately 93% 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 FY19 is \$1,640,300 (10% of budget). However, the actual MFA required cannot be accurately calculated due to outstanding invoices as of the date of this report.

**Table 3. DES Expenses and Revenues to Date**

Item	FY19 Budget	First Quarter Expenses	Second Quarter Expenses	Third Quarter Expenses	Fourth Quarter Expenses	Total Spending to Date	% of Budget
<b>Operating Management Fee</b>							
<b>FOC: Basic</b>	\$ 4,563,000	\$ 1,130,774	\$ 1,123,246	\$ 1,080,773	\$ 1,080,773	\$ 4,415,565	96.77%
9th Chiller	\$ 42,800	\$ 10,595	\$ 10,595	\$ 10,595	\$ 10,595	\$ 42,382	99.02%
C/O 6A	\$ 84,400	\$ 20,919	\$ 20,919	\$ 20,919	\$ 20,919	\$ 83,675	99.14%
C/O 6B	\$ 73,900	\$ 18,314	\$ 18,314	\$ 18,314	\$ 18,314	\$ 73,254	99.13%
C/O 7	\$ 27,800	\$ 6,899	\$ 6,899	\$ 6,899	\$ 6,899	\$ 27,597	99.27%
C/O 8	\$ 12,100	\$ 3,019	\$ 3,019	\$ 3,019	\$ 3,019	\$ 12,077	99.81%
<b>Pass-thru Charges:</b>							
Chemical Treatment	\$ 245,700	\$ 55,185	\$ 60,532	\$ 50,851	\$ 48,201	\$ 214,770	87.41%
Insurance	\$ 21,200	\$ -	\$ 5,178	\$ -	\$ -	\$ 5,178	24.42%
<b>Marketing:</b>							
CNE Sales Activity	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Incentive Payments	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
<b>FEA:</b>							
Steam	\$ 66,400	\$ 17,451	\$ 37,309	\$ 42,389	\$ 23,130	\$ 120,279	181.14%
Chilled Water	\$ 186,400	\$ 134,260	\$ 55,261	\$ 49,024	\$ 93,686	\$ 332,231	178.24%
<b>Misc:</b>							
Metro Credit	\$ -	\$ (233,952)	\$ (133,181)	\$ (146,175)	\$ (151,300)	\$ (664,608)	n.a.
ARFA	\$ 64,800	\$ 16,423	\$ 16,423	\$ 16,423	\$ 16,423	\$ 65,691	101.37%
Deferral	\$ -	\$ -	\$ -	\$ (90,718)	\$ (116,816)	\$ (207,534)	n.a.
<b>Subtotal - Man Fee =</b>	<b>\$ 5,388,500</b>	<b>\$ 1,413,839</b>	<b>\$ 1,357,696</b>	<b>\$ 1,208,487</b>	<b>\$ 1,205,143</b>	<b>\$ 5,185,164</b>	<b>96.23%</b>
<b>Reimbursed Management Fee + Chem Treatment</b>		\$ 1,413,839	\$ 1,352,518	\$ 1,208,487	\$ 1,205,143	\$ 5,179,986	0.00%
<b>Metro Costs</b>							
<b>Pass-thru Charges:</b>							
Engineering	\$ 26,300	\$ 6,785	\$ 16,532	\$ 7,088	\$ 5,842	\$ 36,248	137.82%
EDS R&I Transfers	\$ 281,700	\$ 70,425	\$ 70,425	\$ 70,425	\$ 70,425	\$ 281,700	100.00%
Metro Marketing	\$ 10,900	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Project Administration	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Metro Incremental Cost	\$ 554,900	\$ 164,631	\$ 123,203	\$ 160,296	\$ 127,235	\$ 575,364	103.69%
<b>Utility Costs:</b>							
Water/Sewer	\$ 654,200	\$ 214,678	\$ 116,093	\$ 132,004	\$ 136,694	\$ 599,469	91.63%
EDS Water/Sewer	\$ -	\$ 40	\$ 148	\$ 309	\$ 201	\$ 699	n.a.
EDS Electricity	\$ 39,800	\$ 19,274	\$ 17,256	\$ 14,171	\$ 14,641	\$ 65,342	164.18%
Electricity	\$ 5,537,600	\$ 1,997,041	\$ 925,358	\$ 789,020	\$ 1,282,461	\$ 4,993,879	90.18%
Natural Gas Consultant	\$ 12,400	\$ 3,000	\$ 3,000	\$ 3,000	\$ -	\$ 9,000	72.58%
Natural Gas Transport	\$ -	\$ 59,610	\$ 101,391	\$ 117,623	\$ 59,142	\$ 337,766	n.a.
Natural Gas Fuel	\$ 2,865,900	\$ 264,902	\$ 656,190	\$ 693,404	\$ 272,296	\$ 1,886,792	65.84%
Propane	\$ -	\$ 10,704	\$ -	\$ 59,992	\$ -	\$ 70,696	n.a.
<b>Subtotal - Metro Costs =</b>	<b>\$ 9,983,700</b>	<b>\$ 2,811,090</b>	<b>\$ 2,029,597</b>	<b>\$ 2,047,333</b>	<b>\$ 1,968,936</b>	<b>\$ 8,856,956</b>	<b>88.71%</b>
<b>Subtotal - Operations =</b>	<b>\$ 15,372,200</b>	<b>\$ 4,224,929</b>	<b>\$ 3,387,293</b>	<b>\$ 3,255,820</b>	<b>\$ 3,174,078</b>	<b>\$ 14,042,120</b>	<b>91.35%</b>
<b>Debt Service</b>							
2012 Bonds	\$ 3,478,200	\$ 871,313	\$ 868,963	\$ 868,963	\$ 868,963	\$ 3,478,200	100.00%
2005 Bonds -Self Funded	\$ 716,800	\$ 667,444	\$ -	\$ 49,323	\$ -	\$ 716,768	100.00%
2007 Bonds -Self Funded	\$ 187,300	\$ 46,825	\$ 46,825	\$ 46,825	\$ 46,825	\$ 187,300	100.00%
2008 Bonds -Self Funded	\$ 186,900	\$ 46,725	\$ 46,725	\$ 46,725	\$ 46,725	\$ 186,900	100.00%
2010 Bonds -Self Funded	\$ 188,000	\$ 47,000	\$ 46,725	\$ 47,000	\$ 47,000	\$ 187,725	99.85%
Fund 49107 -Self Funded	\$ 663,000	\$ 165,750	\$ 165,750	\$ 165,750	\$ 165,750	\$ 663,000	100.00%
MIP	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Oper. Reserve Fund	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
<b>Subtotal - Capital =</b>	<b>\$ 5,420,200</b>	<b>\$ 1,845,057</b>	<b>\$ 1,174,988</b>	<b>\$ 1,224,586</b>	<b>\$ 1,175,263</b>	<b>\$ 5,419,893</b>	<b>99.99%</b>
<b>Total =</b>	<b>\$ 20,792,400</b>	<b>\$ 6,069,986</b>	<b>\$ 4,562,280</b>	<b>\$ 4,480,406</b>	<b>\$ 4,349,341</b>	<b>\$ 19,462,013</b>	<b>93.60%</b>
<b>Customer Revenues</b>							
Taxes Collected		\$ 102,554	\$ 88,884	\$ 83,590	\$ 87,448	\$ 362,475	n.a.
Taxes Paid		\$ 102,554	\$ 88,883	\$ 83,589	\$ 87,448	\$ 362,474	n.a.
Interest & Misc Revenue	\$ 153,600	\$ 36,969	\$ 50,843	\$ 59,523	\$ 43,630	\$ 190,965	124.33%
Penalty Revenues/Credits		\$ 53,355	\$ 19,984	\$ (57,422)	\$ (26,468)	\$ (10,550)	n.a.
Energy Revenues Collected		\$ 5,031,755	\$ 4,307,520	\$ 4,159,557	\$ 4,146,622	\$ 17,645,454	93.12%
<b>Revenues =</b>	<b>\$ 19,152,100</b>	<b>\$ 5,122,079</b>	<b>\$ 4,378,348</b>	<b>\$ 4,161,659</b>	<b>\$ 4,163,784</b>	<b>\$ 17,825,870</b>	<b>93.08%</b>
<b>Metro Funding Amount =</b>	<b>\$ 1,640,300</b>	<b>\$ 947,908</b>	<b>\$ 183,932</b>	<b>\$ 318,748</b>	<b>\$ 185,557</b>	<b>\$ 1,636,143</b>	<b>99.75%</b>

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

**Table 4. Customer Revenue Summary to Date**

Building	Chilled Water			Steam		
	Total Cost	Consumption (tonhrs/yr)	Unit Cost (\$/tonhr)	Total Cost	Consumption (Mlb/yr)	Unit Cost (\$/Mlb)
Private Customers	\$ 3,789,707	19,830,517	\$ 0.1911	\$ 1,549,041	102,454	\$ 15.1193
State Government	\$ 3,288,168	13,473,126	\$ 0.2441	\$ 1,881,143	118,781	\$ 15.8371
Metro Government	\$ 5,104,098	28,673,437	\$ 0.1780	\$ 1,983,655	158,062	\$ 12.5498
New Customers	\$ 3,309,332	19,220,401	\$ 0.1722	\$ 1,380,391	125,110	\$ 11.0334
<b>Total</b>	<b>\$ 12,181,973</b>	<b>61,977,080</b>	<b>\$ 0.1966</b>	<b>\$ 5,413,839</b>	<b>379,297</b>	<b>\$ 14.2733</b>

Total Revenue	\$	17,595,812
True-up and Adjustments (Net)	\$	230,058
Net Revenue	\$	17,825,870

### III. EGF Operations

Items relating to the facility operations presented herein are derived from the monthly reports issued by CNE for FY19. 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.

- The entire EGF was shut down on April 5 to allow NES to perform maintenance on the air switches on their side of the electrical switchyard. The chilled water temperature exceeded 43.3°F for approximately 5 hours and the steam pressure dropped below 150 psi for approximately 7 hours.
- The restoration of chilled water service to the Renaissance Hotel on May 7 resulted in an increase in the chilled water sendout temperature above 43.3°F for approximately 40 minutes.
- CNE Maintenance personnel replaced a feedwater bypass valve at the EGF on June 28, which required the steam system to be shutdown. The steam pressure was below 150 psi for approximately 7 hours. CNE failed to provide the required 30 day notice to the customers and the 45 day notice to DES prior to performing this shut down.

#### B. Efficiency

The operation of the EGF satisfied the guaranteed levels for all commodity usage during the quarter. There were no significant excursions above the guaranteed levels for the current quarter. A more detailed discussion of the contract guarantee performance was presented previously in this report.

C. Environment, Health and Safety

No environmental violations were reported during the quarter.

Monthly safety meetings were held on PPE, Electrical Safety, Chemical Safety and Emergency Preparedness.

D. Personnel

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

E. Training

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

F. Water Treatment

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

- Steam System
  - The condensate return averaged approximately 69.9% of the steam sendout during the quarter, which represents a 14.2% decrease over the previous Fourth Quarter.
  - Feedwater iron, pH and hardness remained within their acceptable ranges during the quarter.
- Condensing Water System
  - The conductivity of the condensing water continues to be normal with only a few excursions resulting in high cycles of concentration and low blowdown rates.
- Chilled Water System
  - CNE continues to monitor and test for the presence of bacteria in the system. The continuous dosage of the biocide continues. The biological growth in the system, as measured at the EGF and at the customer buildings, has become essentially non-existent.
  - The project to install a side stream filter at the EGF remains on hold pending funding from Metro.

## 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.

- Office and equipment room janitorial services;
- Landscaping, lawn care and site trash pick-up;
- Checked and repaired plant computers and servers;
- Repaired EGF lighting
- Repaired cooling tower drain lines;
- Replaced flash tank site glass;
- Checked and adjusted packing on all pumps;
- Replaced temperature gauge on forklift;
- Check issue security camera #10;
- Remove air curtain in boiler room;
- Repaired #1 softener controls;
- Repair #2 CWP motor;
- Repaired #3 VFD;
- Checked firing rate on #3 Boiler;
- Checked condensate leak between DA Tanks;
- Checked for instrument air leaks;
- Replaced fan shaft and bearings on #5 and #18 Cooling tower
- Repaired #6 Chiller
- Repaired Condensate Return Tank controls
- Replaced air regulators on #2 & #3 Boilers
- NES Power Outage
- Researched EGF efficiency for TEG
- Repaired communications with #5 Chiller
- Repaired #5 CWP packing gland
- Repaired cooling tower blowdown strainer
- Repaired #3 Softener controls
- Unload #2 CWP Motor

- Repaired burner fuel valve on #2 boiler
- Installed booster pump on condensing water sample line
- Checked DA PRV controls
- Repaired flash tank Sight Glass
- Repaired #1 Boiler bottom blowdown valve
- Repaired cooling tower level controller
- Repaired #1 Softener controls
- Repaired EGF fire suppression air compressor
- #10 Security Camera replacement in progress
- Check city water meters
- Investigated #5 CWP trip
- Replaced spool piece on #2 DA vent line
- Replaced #4 Chiller Dynaview Controller
- Replaced #1 Boiler Feed Water Bypass valve (outage)
- Roof leaks repaired
- Other repairs, maintenance and preventative maintenance were made during the quarter and are listed in the monthly reports issued by CNE.

#### H. EGF Walk-through

A quarterly Walk-through of the EGF was performed on June 25, 2019, by Kevin Jacobs, P.E. with TEG. This review involved a tour of the facility with the primary points of interest and concern noted herein. The items noted in this section need to be completed prior to the end of the operating contract for the System Operator in accordance with the ARMA paragraph 12.03.

- During the Fourth Quarter FY17 Walkthrough report, it was noted that additional rust spots were observed on cooling towers #1, #5, #6, #11, #16 and #18. CNE has not made the repairs on the riser tubes. In addition, cooling tower fill being stored on the cooling tower deck beneath the basins has been noted by CNE as being of the new style. No old or damaged fill is currently being stored. No additional work has been performed on the riser tubes since the First Quarter Walkthrough FY18.
- CNE has made an effort to remove cobwebs within the EGF; however, this removal process is ongoing.
- In previous Walkthrough reports, it was noted that significant scale was observed on the louvers to several of the cooling towers. The scale remains on these cooling towers and all of the cells now have scale or deposits on these louvers. CNE does not appear to have addressed this issue since first being noted in the

Fourth Quarter FY17 Walkthrough report. The louvers have become so brittle that cleaning may seriously damage or destroy them. CNE reported that they have discussed the buildup of scale with their water treatment vendor but there does not appear to be a solution to the buildup involving a change in the water treatment. CNE stated that they will investigate other solutions but some action needs to be taken before the buildup affects the cooling tower performance. TEG has been investigating the EGF performance to determine if there has been a recent change. It does appear that the chiller plant efficiency has decreased over the past three years but CNE has not provided sufficient operating data to TEG to confirm the decrease in performance is directly related to the cooling towers.

- In previous Walkthrough reports, it was noted that a leaking chemical feed line was observed on the south side of the southern DA. CNE repaired the original leak but has not cleaned the area affected by the spill. An additional leak has returned but CNE had not repaired it at the time of the Walkthrough. An additional leak with salt build-up was noted on a valve at the sulfite (oxygen scavenger) tank on the mezzanine level. CNE was informed of this issue and stated that they would address it.
- It was previously reported that four of the trees on the west side of the EGF appear had died. One of these trees fell over during recent storms and CNE had made some efforts to remove the debris. CNE needs to cut down and remove the dead trees and replace them.
- In the Third Quarter FY19 Walkthrough report, it was noted that water was leaking from the upper portions of CT14 along the southwest corner of the tower during the walkthrough. Water was also dripping from beneath CT14 along the north side of the tower onto structural steel and near the connection for the equalizing line. Upon further review of CT14, a 0.75" PVC line inside the tower was broken near a fitting and was dumping water along the north face of the inside of the tower. CNE repaired this line and the tower is no longer leaking.
- Graffiti noted in previous reports on the west side of the EGF has been removed. However, someone had pitched a tent on the west side of the EGF. CNE removed the graffiti and the tent had been removed.
- Pallets were noted stacked on the mezzanine level near the water treatment area. CNE was notified and intends to address the issue
- Algae appear to be present in the low points on the roof deck. CNE was notified and intends to address these issues.
- Other action items previously noted to be addressed by CNE have been completed.

#### **IV. Capital Projects**

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

A. Fourth Quarter FY19 Open Projects

The following projects remained open at the end of the Fourth Quarter FY19.

1. DES111 – DES Combined Heat and Power

This project is currently on hold.

2. DES124 - Criminal Justice Center Redevelopment

TEG has prepared a reimbursement request to Metro General Services for the costs incurred by DES due to the demolition and re-construction of the CJC.

3. DES133.1 - Old Convention Center Site Redevelopment: Monitoring of Broadway Tunnel

This project involved the monitoring/reporting on the condition of the Broadway Tunnel related to the construction and blasting at the 5<sup>th</sup> + Broadway Development. Because the City is pursuing reimbursement from the contractor(s) responsible for the blasting and subsequent damage to the tunnel, including the need for the City to reinforce the tunnel and make repairs after the completion of the blasting, this project remains open. The repairs for tunnel damage were completed under project DES164.

4. DES135 – CHW Leak at 5<sup>th</sup> and Union

CNE was contacted regarding green water flowing into a communications contractor's open trench. CNE responded immediately and upon review of the area and consultation with TEG, the decision was made to conduct an emergency excavation to find the source of the water. It was found that an existing drain line from the 20" chilled water piping in Union Street had a hole in it. This hole was repaired during the first week of the 1<sup>st</sup> Quarter FY20. The repair of this leak reduced the system make-up significantly and also reduced the inflow at the JK Polk building. However, other leaks still exist in the chilled water system.

TEG and CNE will continue to monitor the system and its make-up rate. TEG will also remain in contact with the water department regarding the replacement of the water main in 5<sup>th</sup> Avenue North, one block south of the JK Polk Building.

5. DES139 – DES Options Review

TEG and Metro have continued to assist Engie with their due diligence for the purchase and to assist them with customer consents.

6. DES151 – Manhole 23 Repairs

The work on this project was substantially complete on March 23, 2019. This project was closed during the Fourth Quarter FY19.

7. DES152 – Manhole A and Manhole M Coating Repairs

The structural steel in these manholes were cleaned and painted as part of DES107 in 2015. Portions of the paint is now flaking and coming off of these supports. The paint manufacturer reviewed the failing coatings. Their position is that the surface preparation and paint application was at fault. However, TEG employed a painting inspector during this work and records were maintained regarding the ambient conditions, surface preparation and coating application process. Even with this evidence, the paint manufacturer is not willing to warrant the work. Before the existing corrosion progresses, these coating failures need to be repaired, and this project addresses these needed repairs.

This work has been put on hold but is included in the FY20 capital budget request.

8. DES153 – Manhole L Repairs

The structural steel in Manhole L is corroded and needs to be cleaned and painted to prevent any additional corrosion. Additionally, the condensate piping in this manhole experiences fairly severe hammering and the piping configuration needs to be modified to try and alleviate this problem.

TEG started the design for these repairs during the First Quarter FY19. Because of higher priority projects, the design for this project has not been completed. In addition, the main stage for the NFL Draft activities was on top of this manhole, which caused additional delays. The design for this project will be completed and bid during the First Quarter FY20.

9. DES154 – Manhole K Repairs

The structural steel in Manhole K is corroded and needs to be cleaned and painted to prevent any additional corrosion.

TEG started the design for these repairs during the First Quarter FY19, however, due to higher priority projects this work was postponed until FY20.

10. DES157 – Manhole 9 Structural Steel Repairs

The structural steel piping supports in Manhole 9 are badly corroded and need to be replaced and/or cleaned and painted to maintain the integrity of the steam and

condensate piping system. The design and bidding for this project will be take place during the First Quarter FY20.

11. DES158 – Manhole 18A Structural Steel Repairs

The work for the Manhole 18A scope was substantially complete on March 28, 2019.

A Change Directive was issued on this project because it was discovered that a steam/condensate anchor at the east end of the Broadway Tunnel at Manhole 18 had moved to the east 3 to 4 inches. TEG reviewed the piping/anchor and determined that a partial anchor failure had occurred. TEG also analyzed the piping configuration and determined that additional undesirable movement could occur with this piping which could jeopardize the integrity and operation of the steam and condensate system. TEG completed the design for bracing to be installed in Manhole 18 to prevent the further movement of the steam piping. This work was coordinated with CNE and the Manhole 18A contractor and this bracing was substantially completed on March 19, 2019. Additional work will be required over the summer (during low steam loads) to re-position both the steam and condensate return piping and permanently re-anchor this piping. This additional work will be assigned a new project number.

Manhole 18's change directive project will be invoiced and closed during the First Quarter FY20.

12. DES159 – Manhole B2 Structural Steel Repairs

The structural steel piping supports in Manhole B2 are badly corroded and need to be cleaned and coated to maintain the integrity of the steam and condensate piping system. Due to higher priority projects, this project was delayed. This project will be bid during the First Quarter FY20.

13. DES160 – New Service to 5<sup>th</sup> + Broadway Development

The instrumentation and metering system was delivered to the building's contractor during the quarter. Chilled water is expected to be used by the contractor during construction; however, the contractor has not completed enough of the HVAC system to utilize chilled water at this time. The building's substantial completion date is not expected to be until January 2020, at which time, the normal service will begin to the conditioned spaces within the building.

14. DES161 – Manhole S6 Insulation

This project addresses the installation of insulation in Manhole S6 which is a small manhole in the State distribution system. It is anticipated that this work will

take place during the First Quarter FY20. (This project was formerly included in DES143.)

15. DES162 – Service to New Hotel at 3<sup>rd</sup> Ave & Molloy

The customer plans to issue a letter of intent for the chilled water service connection and to fully execute the CSA in July 2019. Construction of the line extension is anticipated in the First Quarter FY20 with permanent service available in April 2021.

16. DES163 – New Service to MDHA Parcel K

Negotiations with this potential customer are in the early stages.

17. DES164 – Broadway Tunnel Repairs

Construction began and was completed during the Third Quarter FY19. This project was closed during the Fourth Quarter FY19.

18. DES165 – AA Birch Tunnel Repairs

Construction began and was completed during the Third Quarter FY19. This project was closed during the Fourth Quarter FY19.

19. DES166 – Miscellaneous Tunnel Repairs

Construction began and was completed during the Third Quarter FY19. This project was closed during the Fourth Quarter FY19.

20. DES168 – DES Service to 1<sup>st</sup> and KVB Hotels

TEG began discussions with the engineer and architect for two new hotels proposed to be developed at 1<sup>st</sup> Ave S and KVB. The site load may be 1,500 tons of chilled water and 20,000 pph of steam. Negotiations are in the early stages since the proposed development is preliminary

21. DES169 – Manhole 20 Repairs

Manhole 20 is connected to the 7<sup>th</sup> Avenue Tunnel and houses the steam, condensate return and chilled water service piping to Hume Fogg High School. The pipe support stanchions in this manhole (adjacent to the 7<sup>th</sup> Avenue Tunnel, are badly corroded and require replacement. This project addresses the replacement of these pipe supports.

Design began on this project during the Fourth Quarter FY19 and the project is expected to be bid and awarded during the First Quarter FY20.

B. Fourth Quarter FY19 Closed Projects

DES151, DES164, DES165 and DES166 were closed during the Fourth Quarter FY19.

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	FY19 Spending to Date	Total Spent to Date	Remaining Balance
<b>Fund-49109</b>					
DES119	DES Delta T Issue	\$ 67,000	\$ -	\$ 65,447	\$ 1,553
DES139	Options Review	\$ 63,600	\$ 44,019	\$ 44,019	\$ 19,581
MAS	Miscellaneous Development Projects	\$ 46,900	\$ 1,843	\$ 28,842	\$ 18,058
DES124	CJC Redevelopment	\$ 2,000	\$ 1,843	\$ 1,843	\$ 157
DES133	NCC Development	\$ 10,000	\$ 8,761	\$ 8,761	\$ 1,239
DES133.3	Broadway Tunnel Reinforcement	\$ -	\$ 1,427	\$ 1,427	\$ (1,427)
DES135	Chilled Water Leak 5th and Union	\$ 50,000	\$ 27,670	\$ 27,670	\$ 22,330
DES148	89 Peabody	\$ 10,000	\$ 5,739	\$ 5,739	\$ 4,261
DES151	MH 23 Repairs	\$ -	\$ 7,399	\$ 7,399	\$ (7,399)
<b>Total Closed Projects</b>		<b>\$ 2,493,661</b>	<b>\$ -</b>	<b>\$ 2,405,553</b>	<b>\$ 88,108</b>
Metro Project Admin		\$ -	\$ -	\$ -	\$ -
Project Man, Development, etc		\$ (137,246)	\$ -	\$ -	\$ (137,246)
<b>Total 2010 Bond</b>		<b>\$ 2,605,916</b>	<b>\$ 98,700</b>	<b>\$ 2,596,698</b>	<b>\$ 9,217</b>

<b>Fund-49107</b>					
DES124	CJC Redevelopment	\$ 300,000	\$ 1,403	\$ 359,271	\$ (59,271)
DES130	MH B3 Repair	\$ 20,000	\$ -	\$ 1,468	\$ 18,532
DES133	NCC Development	\$ 40,000	\$ 7,427	\$ 219,513	\$ (179,513)
DES133.3	Broadway Tunnel Reinforcement	\$ 450,000	\$ 212	\$ 435,735	\$ 14,265
DES135	Chilled Water Leak 5th and Union	\$ 200,000	\$ 14,872	\$ 192,629	\$ 7,371
DES138	MH-D	\$ 130,000	\$ -	\$ 121,242	\$ 8,758
DES148	89 Peabody	\$ 10,000	\$ 7,659	\$ 32,737	\$ (22,737)
<b>Total Closed Projects</b>		<b>\$ 7,458,827</b>	<b>\$ -</b>	<b>\$ 6,964,044</b>	<b>\$ 494,783</b>
Metro Project Admin		\$ (129,827)	\$ (0)	\$ 171,140	\$ (300,967)
Project Man, Development, etc		\$ 21,000	\$ -	\$ -	\$ 21,000
<b>Customer Connection Fund</b>		<b>\$ 8,500,000</b>	<b>\$ 31,573</b>	<b>\$ 8,497,779</b>	<b>\$ 2,221</b>

<b>Fund-49116</b>					
DES111	DES CHP	\$22,784,277	\$ -	\$ 168,706	\$22,615,571
DES135	Chilled Water Leak	\$ 100,000	\$ 42,819	\$ 42,819	\$ 57,181
DES139.1	Options Review	\$ 75,000	\$ 78,309	\$ 78,309	\$ (3,309)
DES151	MH 23 Repairs	\$ 175,000	\$ 77,121	\$ 77,121	\$ 97,879
DES152	MH A & M Repairs	\$ -	\$ -	\$ -	\$ -
DES153	MH L Repairs	\$ 110,000	\$ 2,933	\$ 2,933	\$ 107,067
DES154	MH K Repairs	\$ 100	\$ 85	\$ 85	\$ 15
DES157	MH 9 Repairs	\$ 75,000	\$ 19,220	\$ 19,220	\$ 55,780
DES158	MH 18A Repairs	\$ 110,000	\$ 64,662	\$ 64,662	\$ 45,338
DES159	MH B2 Repairs	\$ 110,000	\$ 11,687	\$ 11,687	\$ 98,313
DES160	5th + Broadway Service	\$ 60,000	\$ 47,956	\$ 47,956	\$ 12,044
DES161	MH S6 Insulation	\$ 30,000	\$ -	\$ -	\$ 30,000
DES162	3rd and Molloy Service	\$ 220,000	\$ 33,817	\$ 33,817	\$ 186,183
DES163	Parcel K Service	\$ 707,300	\$ 1,124	\$ 1,124	\$ 706,176
DES164	Broadway Tunnel Repairs	\$ 180,000	\$ 175,329	\$ 175,329	\$ 4,671
DES165	AA Birch Tunnel Repairs	\$ 115,000	\$ 63,242	\$ 63,242	\$ 51,758
DES166	Misc. Tunnel Repairs	\$ 195,000	\$ -	\$ -	\$ 195,000
DES167	EDS Fiber Optic Installation	\$ 5,000	\$ 4,443	\$ 4,443	\$ 557
DES168	1st and KVB Hotels	\$ 10,000	\$ 5,410	\$ 5,410	\$ 4,590
DES169	MH-20 Repairs	\$ 40,000	\$ 9,732	\$ 9,732	\$ 30,268
<b>Total Closed Projects</b>		<b>\$ 15,723</b>	<b>\$ -</b>	<b>\$ 15,723</b>	<b>\$ -</b>
Metro Project Admin		\$ -	\$ -	\$ -	\$ -
Project Man, Development, etc		\$ 882,600	\$ -	\$ -	\$ 882,600
<b>CHP and EDS Repairs</b>		<b>\$ 26,000,000</b>	<b>\$ 637,891</b>	<b>\$ 822,320</b>	<b>\$ 25,177,680</b>

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

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

### A. Repairs and Improvements

Several repairs were made to the EDS and at customer buildings during the quarter. The remaining value of the R&I budget at the end of the current quarter is \$63,714. Tables 6A and 6B provide a summary of the FY19 expenditures and revenues to date associated with the R&I budget.

**Table 6A. FY19 Repair and Improvement Expenditure and Revenue Summary**

Description	Date	Tracking #	Vendor	Expenditure	Transfers	Net Market Adjustment	Market Value	Balance
<b>Value at end of FY18</b>						\$ -	\$ 104,285.39	\$ 104,285.39
DES-144	7/28/2018	DES-2346	TEG	\$ 1,920.75				
DES-147	7/28/2018	DES-2346	TEG	\$ 407.03				
DES-149	7/28/2018	DES-2346	TEG	\$ 127.28				
DES-151	7/28/2018	DES-2346	TEG	\$ 4,412.21				
DES-152	7/28/2018	DES-2346	TEG	\$ 127.28				
DES-149	9/1/2018	DES-2348	CNE	\$ 88,200.26				
EMR 17-004	8/2/2018	DES-2348	CNE	\$ 5,277.44				
Interest/Transfer	07/02/18	-	-	\$ 185.59				
Interest/Transfer	07/02/18	-	-	\$ (185.59)				
CNE July R&I Invoice	09/01/18	DES-2348	CNE	\$ 2,324.97				
DES-144	08/27/18	DES-2346	TEG	\$ 2,497.71				
DES-149	08/27/18	DES-2346	TEG	\$ 42.43				
DES-150	08/27/18	DES-2346	TEG	\$ 1,718.35				
DES-151	08/27/18	DES-2346	TEG	\$ 8,132.38				
DES-153	08/27/18	DES-2346	TEG	\$ 5,606.40				
DES-154	08/27/18	DES-2346	TEG	\$ 3,648.55				
DES-147 (Reimbursement from Star Construction)	08/17/18	DES-2346	-	\$ (12,918.11)				
Interest/Transfer	08/01/18	-	-	\$ 193.12				
Interest/Transfer	08/01/18	-	-	\$ (193.12)				
CNE Aug R&I Invoice	09/19/18	DES-2351	CNE	\$ 4,017.14				
DES-144	10/01/18	DES-2351	TEG	\$ 4,343.33				
DES-150	10/01/18	DES-2351	TEG	\$ 726.93				
DES-151	10/01/18	DES-2351	TEG	\$ 3,097.58				
DES-153	10/01/18	DES-2351	TEG	\$ 6,885.45				
DES-154	10/01/18	DES-2351	TEG	\$ 721.23				
DES-155	10/01/18	DES-2351	TEG	\$ 489.57				
DES-156	10/01/18	DES-2351	TEG	\$ 678.80				
Interest/Transfer	09/04/18	-	-	\$ 230.69				
Interest/Transfer	09/04/18	-	-	\$ (230.69)				
CNE Sept R&I Invoice	11/01/18	DES-2353	CNE	\$ 8,675.15				
<b>Sub-Total First Quarter</b>				<b>\$ 141,160.11</b>	<b>\$ 70,425.00</b>	<b>\$ -</b>	<b>\$ (70,735.11)</b>	<b>\$ (70,735.11)</b>

**Table 6B. FY19 Repair and Improvement Expenditure and Revenue Summary**

Description	Date	Tracking #	Vendor	Expenditure	Transfers	Net Market Adjustment	Market Value	Balance
DES-144	10/29/18	DES-2351	TEG	\$ 1,879.53				
DES-151	10/29/18	DES-2351	TEG	\$ 169.70				
DES-155	10/29/18	DES-2351	TEG	\$ 776.27				
DES-156	10/29/18	DES-2351	TEG	\$ 691.42				
Interest/Transfer	10/02/18	-	-	\$ 262.18				
Interest/Transfer	10/02/18	-	-	\$ (262.18)				
DES-144	01/02/19	DES-2357	TEG	\$ 1,926.28				
DES-156	01/02/19	DES-2357	TEG	\$ 279.00				
CNE Oct R&I Invoice	12/01/18	DES-2355	CNE	\$ 7,736.95				
DES-144	12/01/18	DES-2355	CNE	\$ 40,000.00				
Interest/Transfer	11/01/18	-	-	\$ 296.02				
Interest/Transfer	11/01/18	-	-	\$ (296.02)				
CNE Nov R&I Invoice	01/24/19	DES-2357	CNE	\$ 8,253.54				
DES-151	01/02/19	DES-2357	TEG	\$ 546.90				
DES-155	01/02/19	DES-2357	TEG	\$ 2,534.59				
DES-156	01/02/19	DES-2357	TEG	\$ 1,095.76				
DES-156	01/24/19	DES-2357	CNE	\$ 4,929.00				
DES-155	01/24/19	DES-2357	CNE	\$ 15,281.00				
DES-144	01/24/19	DES-2357	CNE	\$ 20,556.00				
CNE Dec R&I Invoice	01/25/19	DES-2357	CNE	\$ 8,263.62				
Interest/Transfer	12/03/18	-	-	\$ 245.54				
Interest/Transfer	12/03/18	-	-	\$ (245.54)				
<b>Sub-Total Second Quarter</b>				<b>\$ 114,919.56</b>	<b>\$ 70,425.00</b>	<b>\$ -</b>	<b>\$ (44,494.56)</b>	<b>\$ (44,494.56)</b>
Interest/Transfer	01/02/19	-	-	\$ 235.04				
Interest/Transfer	01/02/19	-	-	\$ (235.04)				
CNE Jan R&I Invoice	03/01/19	DES-2361	CNE	\$ 3,808.28				
DES-144	03/02/19	DES-2361	TEG	\$ 5,488.55				
Interest/Transfer	02/01/19	-	-	\$ 285.86				
Interest/Transfer	02/01/19	-	-	\$ (285.86)				
CNE Feb R&I Invoice	04/18/19	DES-2363	CNE	\$ 11,339.55				
DES-149	02/25/19	DES-2359	CNE	\$ 10,237.21				
Interest/Transfer	03/01/19	-	-	\$ 202.09				
Interest/Transfer	03/01/19	-	-	\$ (202.09)				
<b>Sub-Total Third Quarter</b>				<b>\$ 30,873.59</b>	<b>\$ 70,425.00</b>	<b>\$ -</b>	<b>\$ 39,551.41</b>	<b>\$ 39,551.41</b>
CNE March R&I Invoice	04/17/18	-	CNE	\$ 9,359.58				
Interest/Transfer	04/01/19	-	-	\$ 98.80				
Interest/Transfer	04/01/19	-	-	\$ (98.80)				
CNE Apr R&I Invoice	05/15/19	-	CNE	\$ 15,858.87				
Interest/Transfer	05/01/19	-	-	\$ 116.26				
Interest/Transfer	05/01/19	-	-	\$ (116.26)				
CNE May R&I Invoice	06/30/19	-	CNE	\$ 2,103.42				
Interest/Transfer	06/03/19	-	-	\$ 139.09				
Interest/Transfer	06/03/19	-	-	\$ (139.09)				
CNE June R&I Invoice	07/17/19	-	CNE	\$ 7,996.18				
<b>Sub-Total Fourth Quarter</b>				<b>\$ 35,318.05</b>	<b>\$ 70,425.00</b>	<b>\$ -</b>	<b>\$ 35,106.95</b>	<b>\$ 35,106.95</b>
<b>FY19 Year to Date</b>				<b>\$ 322,271.31</b>	<b>\$ 281,700.00</b>	<b>\$ -</b>	<b>\$ 63,714.08</b>	<b>\$ 63,714.08</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.

1. EDS Manhole Inspections
  - a. The monthly vault reviews were generally conducted as scheduled. However, with the amount of construction taking place within the downtown area, some manholes were not accessible.
  - b. Customer metering station calibration checks were completed as scheduled.

- c. Water chemistry samples at customer buildings were taken as scheduled.
  - d. Several of the vaults continue to require pumping due to the accumulation of either groundwater or surface water.
  - e. CNE continues to fabricate and replace trap assemblies within the EDS.
- 2. Other EDS Inspections
    - a. Other items are included in the CNE monthly reports.

### C. Emergencies

No emergencies were reported during the quarter.

### D. EDS Walk-through

The Fourth Quarter FY 2019 walkthrough was conducted on July 24, 2019. The manholes that were visited included A, B, B5, K, L, M, N1, N2, S5, and S6. The following comments and observations are a result of these visits. There is an action item list at the end of this report.

#### 1. Manhole A

- a. There was water present in this manhole and it required pumping prior to entry.
- b. There are some small areas of spalled concrete in the ceiling caused by the proximity of the “feet” of rebar chairs to the surface of the concrete. CNE should monitor these areas and report any further degradation to TEG.
- c. There is some flaking of the paint on the steel supports. These supports were cleaned and painted as a part of DES-107 in 2015. Soon after this project was completed, TEG noticed the paint failing and contacted the paint inspector and the paint manufacturer. A site meeting occurred to review the failing paint and even though the paint inspector had records proving that the paint was applied per specifications, the paint manufacturer determined that the failure was caused by application errors. The paint failure occurred outside the initial 12 month warranty. TEG disagree with the paint manufacturer’s position and will develop repair a scope for CNE to initiate repairs. This project should be combined with paint and insulation repair in Manhole M because Manhole M was painted at the same time as Manhole A.

#### 2. Manhole B

- a. There was a small amount of water in the floor of both sides of this manhole.

- b. There is some debris in the chilled water side of the manhole which should be removed. This includes some dirt and a safety cone. **This item appeared in the last two years' reports and requires immediate action.**
  - c. The bases of the piping supports appear to have some rust stains caused by "creep" because the underside of the baseplates could not be painted under DES-107. CNE should monitor the condition of the baseplates/supports and notify TEG if corrosion develops.
  - d. The CPVC vent pipe on the steam side of the manhole is dripping water onto the steam piping. CNE should extend this CPVC piping so that the dripping water does not fall on the steam piping.
  - e. A portion of the link seal on the northern steam exit from the manhole has come out of the penetration. CNE should re-install this link seal in the wall penetration.
3. Manhole M
- a. No water was present in this manhole.
  - b. The link seal on the steam line penetration at the northern wall has been dislodged from the top portion of the pipe. CNE personnel have tried to re-position this linkseal without success. CNE should continue to monitor the linkseal and report if water infiltration or other complications arise.
  - c. The steam trap was replaced in this manhole. A portion of the dripleg insulation was removed for this installation. In addition, the piping upstream of the new trap has not been insulated. CNE should proceed with the installation/repair of this insulation as part of the R&I scope. The quotes should include matching the existing insulation on the dripleg and the use of Pyrogel XT insulation on the trap piping. **This item appeared on last years' reports and requires immediate action.**
  - d. The bases of the piping supports have some rust stains caused by "creep" because the underside of the baseplates could not be painted under DES-107. However, there is some corrosion on the edges of some of the baseplates. TEG will develop a repair specification for these baseplates. This project should be included with the paint repair in Manhole A.
4. Manhole L
- a. There was some water in this manhole which required pumping.
  - b. There is some corrosion of the structural components in this manhole, especially on the north side of the anchor beam and on the west side where a strut penetrates the manhole floor. TEG is developing drawings to conduct some repairs in this manhole which should be ready to bid by the first part of August. TEG will coordinate a pre-bid meeting with CNE.
  - c. There is some minor insulation damage that should be repaired on the steam piping that penetrates the north manhole wall. This item appeared on last year's report and will be addressed in the forthcoming project.
  - d. There is also some insulation damage on some of the other piping in the manhole. The forthcoming will also address this need.

- e. The condensate piping in this manhole experiences water/steam hammer events. The forthcoming project being developed by TEG includes components which address this hammering problem.
  - f. The manhole has a “trough” in the floor which accumulates mud and debris. There is a substantial amount of mud in this trough which is covering the dripleg drain piping. This mud needs to be removed. TEG will include the removal of this mud in the forthcoming project.
  - g. The northern condensate slip joint appears to be leaking. CNE should remove the insulation blanket from this slip joint and confirm that the joint is leaking. If the joint is leaking, CNE should monitor the joint and make repairs as soon as possible.
  - h. There is a small spalled hole in the western concrete wall. CNE should monitor this spall and notify TEG of any significant changes.
5. Manhole K
- a. There is some mud in the floor of the manhole. CNE should clean this mud from the manhole.
  - b. There is some corrosion of the structural components in this manhole. TEG will prioritize the extent of the corrosion in this manhole, and coordinate with CNE to have these metal surfaces cleaned and coated.
  - c. There are some hairline cracks in the concrete patching of the southern manhole wall. CNE should monitor these cracks and notify TEG of any significant changes.
  - d. The trap in this manhole is an Armstrong Series 20XX which CNE is in the process of replacing due to poor reliability. **This item appeared in last two year’s reports and requires immediate action because the trap is now blowing through.**
  - e. The strainer upstream of the steam trap does not have a blowdown valve. CNE should add a blowdown valve to this strainer when the trap is replaced. **This item appeared in prior two year’s reports and requires immediate action.**
6. Manhole N1
- a. There was no water present in this manhole.
  - b. The CHW branch connections for Nissan Stadium were never insulated in this manhole. Most of the piping in this manhole is ductile iron; however, there are some steel components and the surface condensation has caused some corrosion. Therefore, the non-insulated piping in this manhole should be insulated. This project was postponed in the FY19 budget. TEG will provide specifications to CNE to have this manhole insulated.
  - c. The piping supports in this manhole have surface corrosion and should be wire wheeled, cleaned and coated to prevent further corrosion. TEG will coordinate with CNE to have this work completed.

7. Manhole N2
  - a. The manhole could not be entered due to low oxygen readings.
  - b. From prior reviews of this manhole, the CHW isolation valves the bypass piping in this manhole were never insulated. The surface condensing/"sweating" is causing some corrosion to occur, therefore, the uninsulated piping in this manhole should be insulated. This project was postponed in the FY19 budget. TEG will provide specifications to CNE to have this manhole insulated.
  
8. Manhole S5
  - a. There were no deficiencies to report. (This manhole was re-piped and galvanized anchors/supports were installed in FY15.)
  
9. Manhole S6
  - a. There was no water in the manhole.
  - b. The structural steel in this manhole is corroded as well as the steam and condensate piping - insulation is non-existent. The life of the piping can be extended with the installation of insulation in this manhole. This project was postponed in the FY19 budget. TEG will provide specifications to CNE to have this manhole insulated.
  - c. The lid on this manhole is extremely heavy and difficult to remove. CNE should add this manhole to the list to replace the manway lid. If possible, the frame does not need to be replaced if a replacement lid can be obtained.
  
10. Manhole B5
  - a. The access grating panels to this manhole were padlocked so an adequate review of this manhole could not be conducted. CNE should obtain keys to this padlock allowing CNE access as the need arises.

### **Action Items**

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

## **VI. Customer Relations**

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

#### A. Marketing

Negotiations on the CSA with CB Ragland are ongoing. The DES anticipates having an executed CSA in the First Quarter of FY20 for chilled water service to their proposed 253 room hotel to be constructed along Molloy Street between 2<sup>nd</sup> and 3<sup>rd</sup> Avenues South. This project is tracked under project number DES-162.

The initial conversations with the engineering team for two proposed hotels at 1<sup>st</sup> Ave S and KVB began during the quarter. This project is tracked under DES-168.

The developer and engineering team for Lot K reported that they remain interested in DES service but are continuing to work through a revised building plan.

#### 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.

- A chilled water leak was discovered near MH-N2 by CNE in April. CNE coordinated a shutdown with Nissan Stadium to make repairs.
- CNE asked the MCC to place their condensate to drain while CNE repaired a condensate strainer blow down line in MH-B8 in April. Repairs were made the following day and service was restored to normal.
- The Sheraton Hotel reported to CNE that steam vapor was present at the front entrance steps. CNE and a representative from TEG visited the site and did not observe steam vapors in the area; however, the sidewalk was extremely hot. The following day CNE began an investigation and found a steam trap blowing through and discharging into the main steam line casing. This trap line was isolated. On May 15<sup>th</sup>, the faulty trap was replaced and the discharge line was re-routed to the condensate receiver tank. The main entrance area sidewalk returned to ambient temperature.
- Tennessee Tower reported a steam leak to CNE in May that was determined to be on the piping for which DES has responsibility. CNE completed the repairs by the end of May.
- CNE scheduled a steam service outage to the Fairlane Hotel in May to repair a leak in MH-4. Service was restored after repairs were made.
- The Nashville City Center reported low chilled water flow to CNE. After reviewing the data, CNE suggested that the building clean the plate and frame heat exchanger. CNE assisted building personnel back-flush the unit on May 23<sup>rd</sup> but there was little improvement. The TCV was also checked to make sure that it was operating properly. The building plans to have the heat exchanger opened and cleaned.

- CNE isolated the chilled water heat exchanger at the Metro Courthouse in June and energized the bypass after the building reported cooling issues. Upon review of the building data, TEG and CNE determined that the heat exchanger may need to be cleaned.
- CNE scheduled a steam system shutdown in June to replace a leaking feedwater valve. CNE did not provide the required 30 day notification to the DES customers or the 45 day notice to Metro prior to the shutdown.
- Other minor issues and customer interactions are noted in the monthly reports from CNE.

## **VII. Recommendations**

Based on the review of the Fourth Quarter FY19 EGF and EDS operations, the following recommendations are made.

- The items noted in the Walkthrough Reports as in need of repair need to be completed prior to the end of the operating contract for the System Operator in accordance with the ARMA paragraph 12.03.
- CNE needs to address the issues related to the cooling towers at the EGF and improve the overall chiller plant efficiency.
- Corroded structural steel within the vaults and tunnels should be cleaned and coated or replaced.
- Insulation which is absent, or in disrepair, in the vaults should be addressed through additional capital and R&I projects, and through regular maintenance provided by CNE.
- Steam traps which need repair or replacement should be addressed as soon as possible.
- Expansion joint leaks should be repaired by either tightening the packing bolts or injection of packing once the leak(s) is substantial enough for the repair to be effective.
- Debris needs to be cleaned and removed from some manholes.