



Operations Monitoring Report

Fourth Quarter FY18

Prepared by:

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I. Executive Summary

A review of the fiscal year 2018 (FY18) 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 2018 to date, CNE has satisfactorily met all of the contract obligations to Metro and has had no contract violations.

For the Fourth Quarter FY18, the chilled water sales increased 6.0% over the previous Fourth Quarter (FY17). The increase in sales may be due to an increase in the number of cooling degree days during the quarter (31.0%). The chilled water sendout also increased 4.5% over the previous Fourth Quarter. The system losses decreased approximately 23%. The peak chilled water demand for the current quarter was 17,408 tons, which is 0.7% lower than the previous Fourth Quarter.

For the Fiscal Year, the chilled water sales decreased 6.6% over the previous fiscal year which may be due to the demolition and renovation of the Old Convention Center, the Criminal Justice Center and the Bobby Hotel (Wells Fargo Building). The number of cooling degree days for FY18 was also lower than in FY17 by 5.6%. The chilled water sendout also decreased 7.0% over the previous fiscal year. The system losses decreased 15.3% over FY17. The peak chilled water demand for FY18 was 17,800 tons, which is 11% lower than in FY17.

Steam sendout for the current quarter increased by approximately 13.4% over the previous Fourth Quarter with a 94.7% increase in heating degree days. Likewise, steam sales also increased by approximately 18.2% over the previous Fourth Quarter. Total steam system losses decreased by 2.2% over the previous Fourth Quarter. The peak steam demand for the current quarter was 95,500 pounds per hour, which represents an increase in the Fourth Quarter demand by approximately 26.2%.

For the Fiscal Year, the steam sales increased 3.3% over the sales in FY17. The steam sendout also increase 12.5% over FY17 with a noted 36.3% increase in the total number of heating degree days. The total steam losses increased 3.3% in FY18. The peak steam demand for FY18 was 150,565 pph, which is a 10.5% increase over FY17/

The EGF performance continues to satisfactorily meet the System Performance Guarantee (Guaranteed Maximum Quantity or GMQ) levels. The chilled water plant electric consumption per unit of sales continues to perform lower than the guaranteed levels for both the quarter and FY18. Total chiller plant electric usage decreased 5.1% from the previous Fourth Quarter and the unit electric consumption was 0.9% higher than in the previous Fourth Quarter. The steam plant electric consumption per unit of sales also decreased over the previous Fourth Quarter by 7.6%. The total water consumption for the steam and chilled water plants increased 8.5% from the previous Fourth Quarter. The steam plant water usage decreased by 27.3% for the quarter.

For the Fiscal Year, the total plant electric consumption decreased 4.9% over FY17. The unit electric consumption for chilled water increased 1.6% over FY17 but the steam plant unit electric consumption decreased by 7.6%. The total plant water consumption decreased by 2.4% in FY18. The chiller plant unit water consumption increased 4.8% in FY18 but the steam plant unit water consumption decreased 5.4%. The steam plant fuel efficiency remained approximately the same in FY18 as in FY17 but the annual condensate return increased 7% over FY17.

Work continued on DES Capital and Repair & Improvement Projects during the Fourth Quarter of FY18. Repair and Improvements to the EDS continue as scheduled. Construction was completed on DES146 and it was closed during the Fourth Quarter FY18. Construction was also completed on DES147 during the Fourth Quarter FY18 and final invoicing is pending. Once final invoicing is complete, reimbursement will be sought from the contractor that caused the damage. Construction was started and completed on DES149 with final invoicing pending. Work on DES133, DES135, DES139, DES143 and DES148 is ongoing. Design for DES144 was completed during the Fourth Quarter FY18 and a pre-bid meeting is scheduled for early in the First Quarter FY19.

The current fiscal year system operating costs to date are \$19,315,661. This value represents approximately 91.5% of the total budgeted operating cost for FY18. The customer revenues from the sales of steam and chilled water for FY18 (to date) are \$17,085,852 which is approximately 88% of the budgeted amount. The difference between the operating costs and customer revenue is the Metro funding amount (MFA), which represents the shortfall in cash flow for the system. The MFA transferred to date for FY18 is \$1,690,300 (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 6.0% increase in sales for the current quarter over the same quarter of the previous fiscal year.

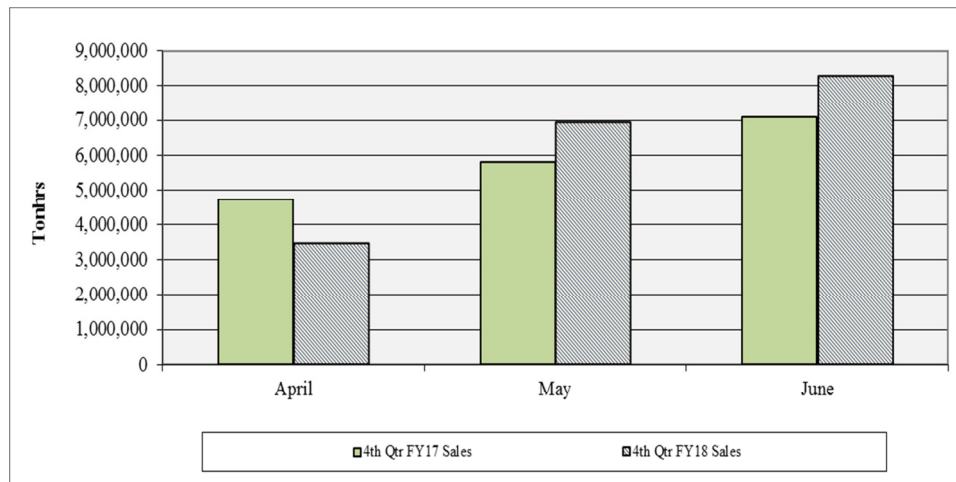


Figure 1. Chilled Water Sales Comparison

The peak chilled water demand for the current quarter was 17,408 tons, which represents a 0.7% 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.

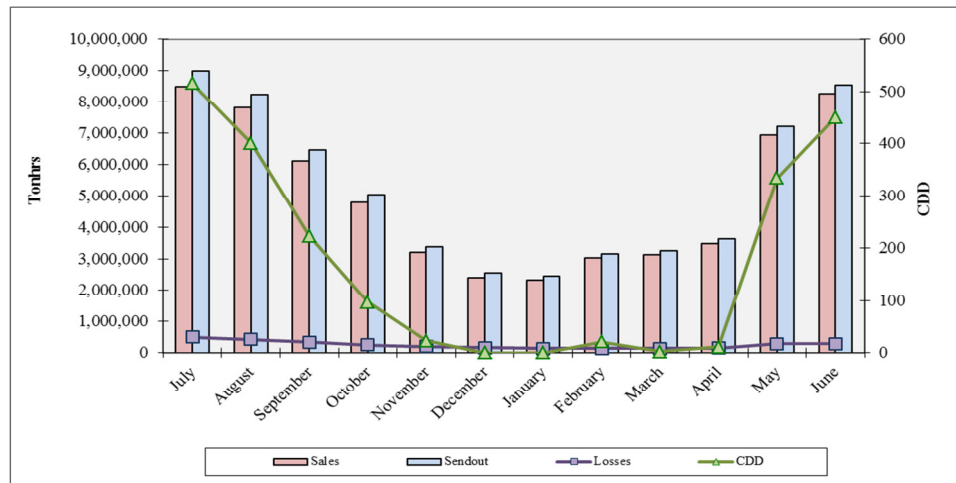


Figure 2. Chilled Water Sales, Sendout, Losses and CDD for the Previous Twelve Months

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.

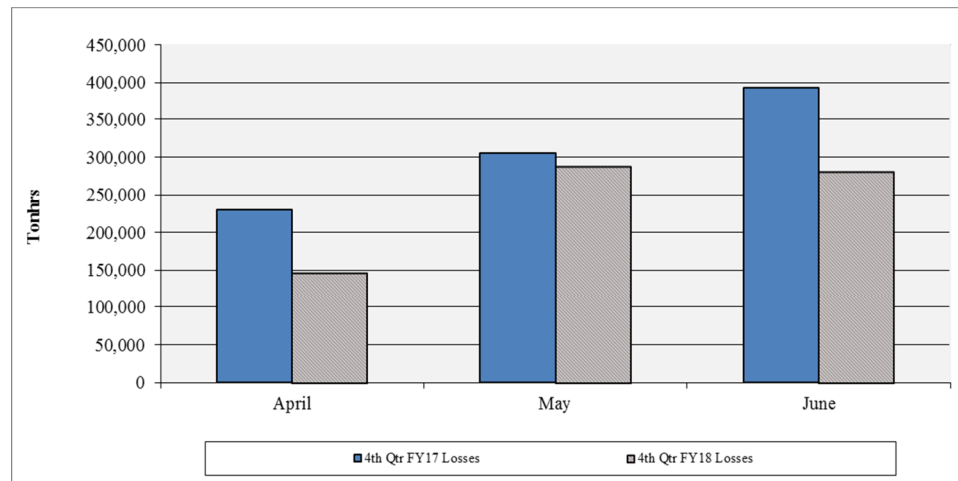


Figure 3. Chilled Water System Loss Comparison

The EDS make-up decreased by approximately 29.6% over the previous Fourth Quarter due to the distribution leak that was repaired during the Third Quarter. Additional locations for leaks are suspected but additional excavations may not begin again until after the cooling season. Any repairs to the chilled water piping will have to be made immediately and most likely require the shutdown of customer buildings.

The make-up to the cooling towers increased approximately 20.2% during the quarter. The number of cycles of concentration in the condensing water circuit experienced a 31.5% increase during the current quarter. The overall city water make-up comparison for the chilled water system is shown in Figure 4.

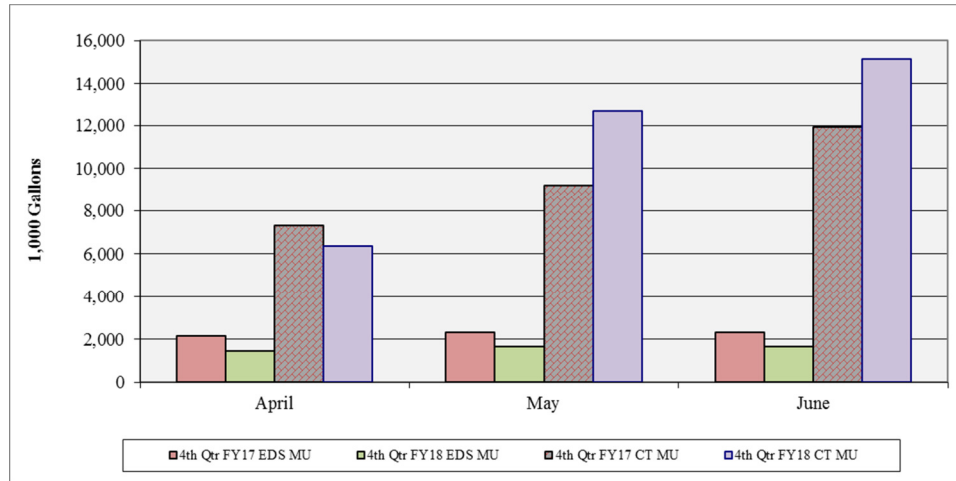


Figure 4. Chilled Water System City Water Usage Comparison

3. Performance

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

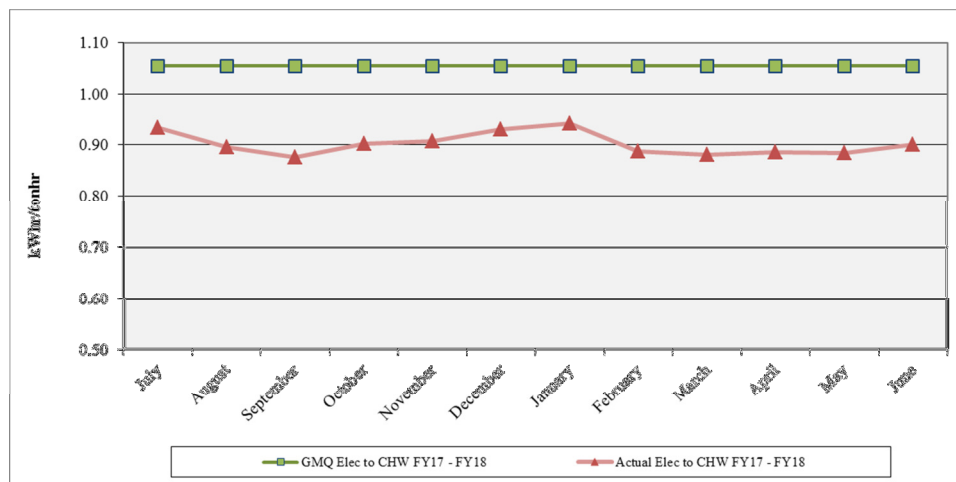


Figure 5. Chiller Plant Electric Performance Guarantee Comparison for the Previous Twelve Months

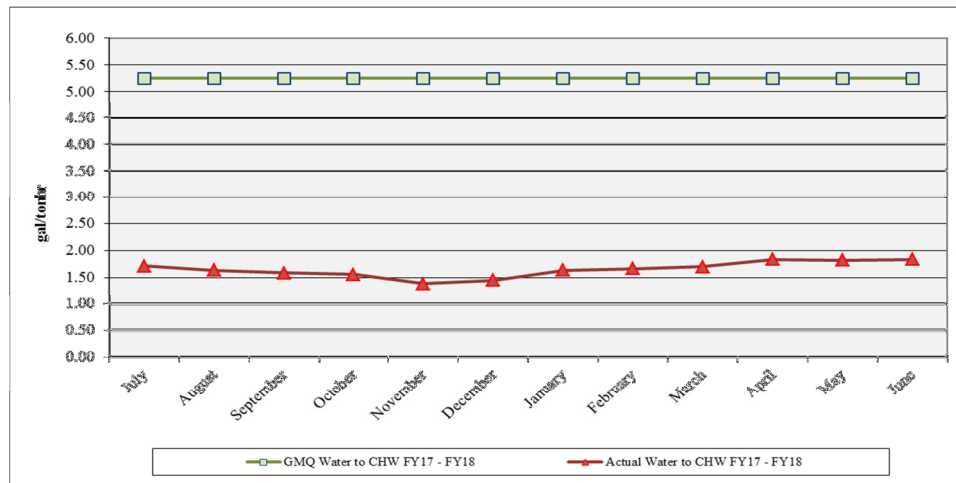


Figure 6. Chiller Plant Water Consumption Performance Guarantee Comparison for the Previous Twelve Months

The chilled water allocation of the electric consumption falls under the GMQ limit of 1.055 kWhr per tonhr for the current quarter, and no excursion is reported for the current fiscal year. The electric usage per unit of sales increased 0.9% over the previous Fourth Quarter.

The actual chiller plant water conversion factor increased 4.4% over the previous Fourth Quarter. The total consumption of city water for the chiller plant for the current quarter increased 8.5%.

B. Steam

1. Sales and Sendout

The steam sendout increased by approximately 4.5% over the previous Fourth Quarter (FY17), and the sales also increased by approximately 18.2%. The Quarter experienced an approximate 94.7% increase in the number of heating degree days. The steam system losses decreased 2.2% over the previous Fourth Quarter. A comparison for the Fourth Quarter steam sales is shown in Figure 7.

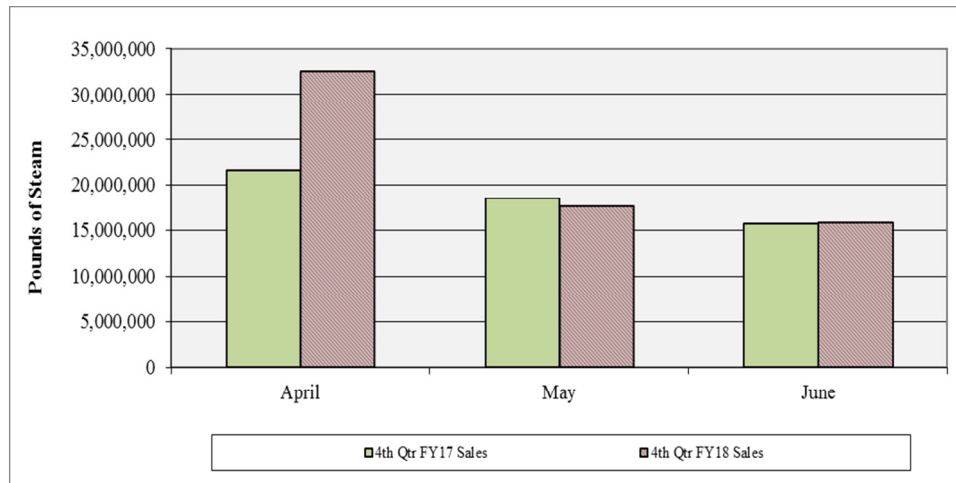


Figure 7. Steam Sales Comparison

The peak steam demand for the current quarter was 95,500 pph, which reflects an approximate 26.2% 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.

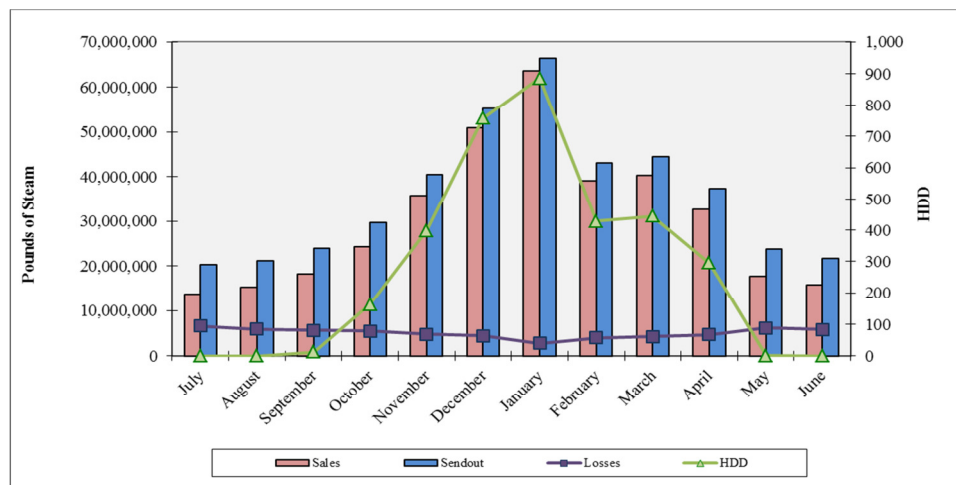


Figure 8. Steam Sales, Sendout, Losses and HDD for the Previous Twelve Months

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.

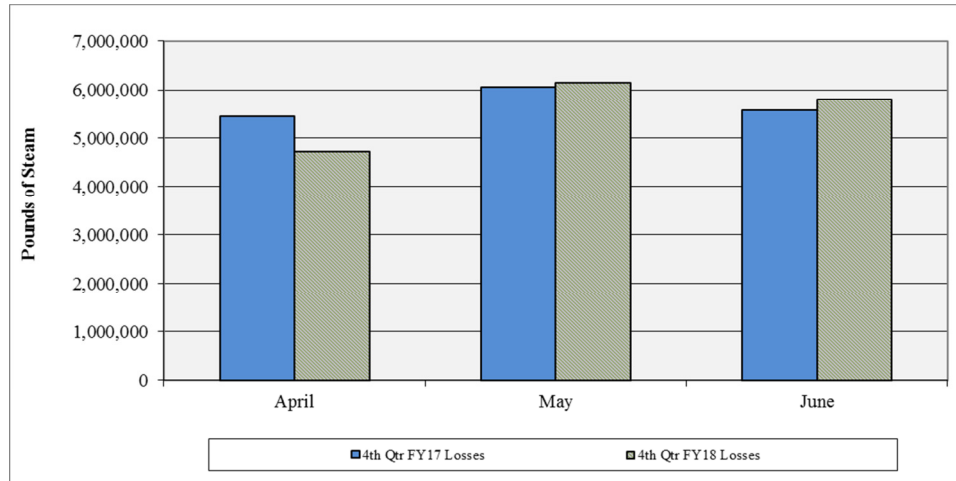


Figure 9. Steam System Losses

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. This data is shown in the comparison of Fourth Quarter data in Figure 10.

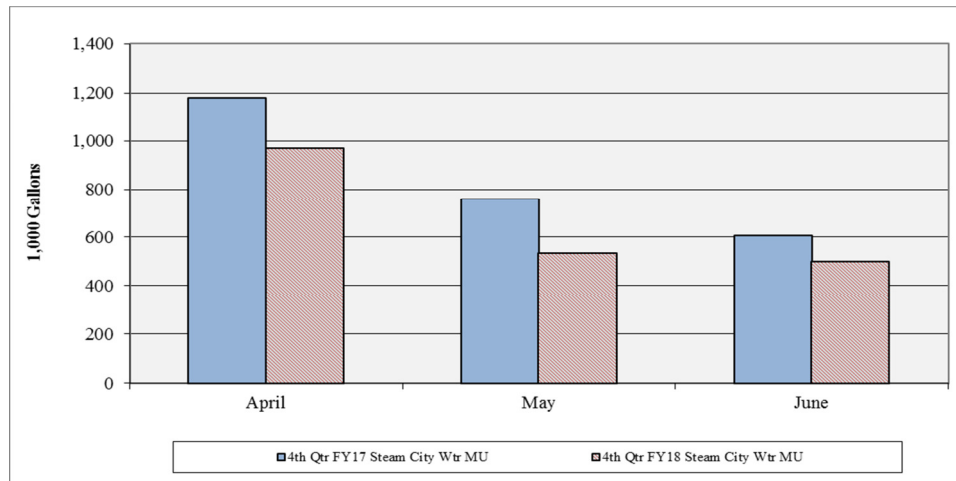


Figure 10. Steam System City Water Make-up Comparison

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.

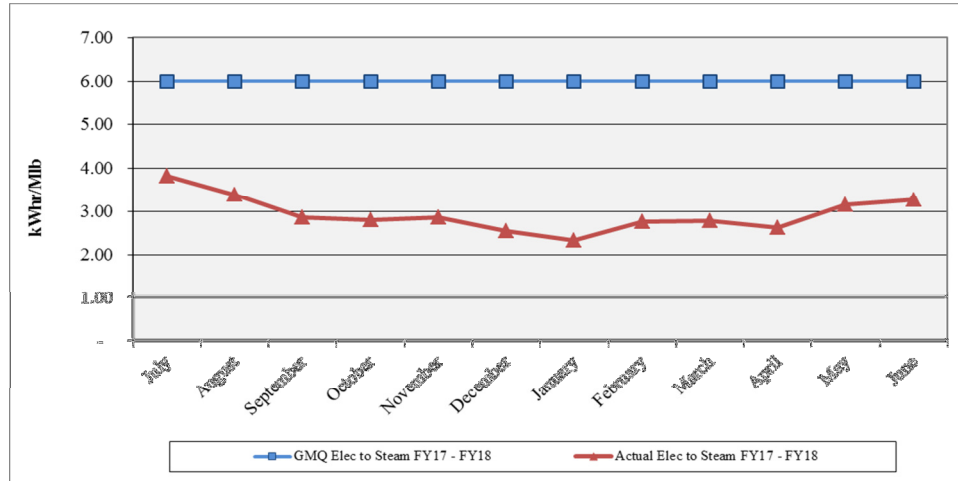


Figure 11. Steam Plant Electric Performance Guarantee for the Previous Twelve Months

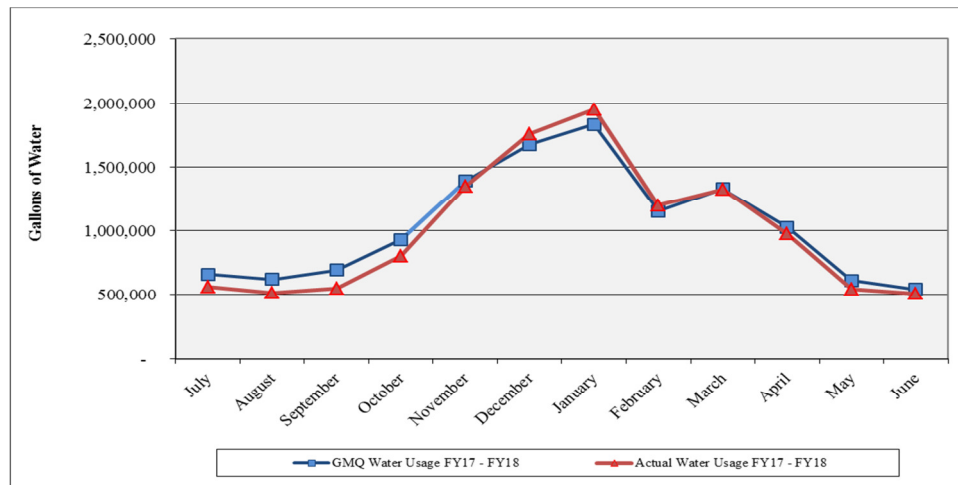


Figure 12. Steam Plant Water Performance Guarantee for the Previous Twelve Months

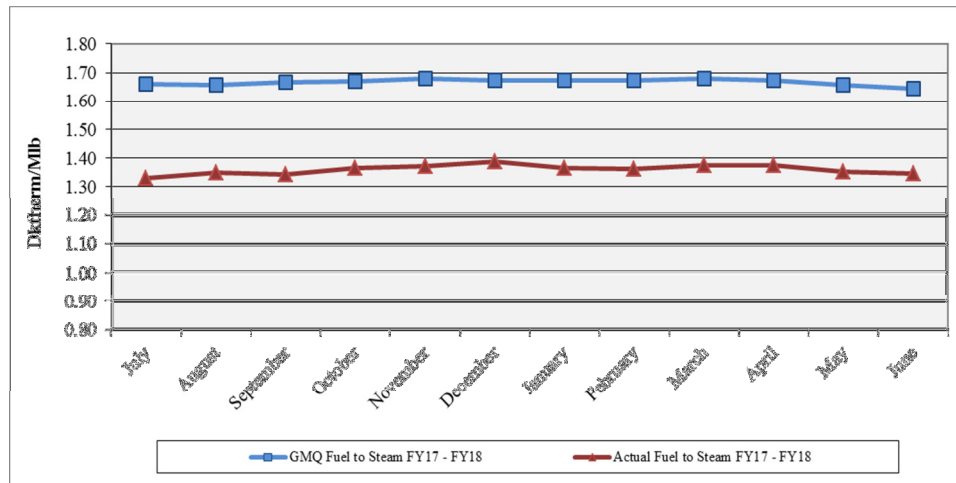


Figure 13. Steam Plant Fuel Performance Guarantee for the Previous Twelve Months

The current quarter experienced an 11.5% increase in the steam plant electric consumption while experiencing a 5.6% decrease in the electric conversion factor. The water consumption for the steam plant decreased 21.3% this quarter as compared to the previous Fourth Quarter. The fuel consumption per unit of steam sales was marginally higher 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 comparisons of the Guaranteed Maximum Quantities (GMQ) of the criteria commodities (fuel, water and electricity).

Table 1. Fourth Quarter FY18 and Annual Production, Sales and Consumption Summary

Item	Unit	Fourth FY18	Fourth FY17	*Percent Difference	Total Year FY18	Total Year FY17	*Percent Difference
	days	91	91	0.00%	365	365	0.00%
Total Electric Use	kWhrs	16,821,677	15,729,286	6.94%	54,962,006	57,799,232	-4.91%
Chilled Water	kWhrs	16,629,150	15,556,724	6.89%	53,946,798	56,837,045	-5.09%
Steam	kWhrs	192,527	172,562	11.57%	1,015,208	962,187	5.51%
Total Water Use	kgal	40,988	37,784	8.48%	138,944	142,281	-2.35%
Total Chilled Water	kgal	38,985	35,240	10.63%	127,040	129,699	-2.05%
EDS Make-up	kgal	4,789	6,799	-29.56%	26,228	26,244	-0.06%
Cooling Towers	kgal	34,196	28,441	20.23%	100,812	103,455	-2.55%
Calc CT Evaporation	kgal	29,485	23,504	25.45%	85,626	82,649	3.60%
CT Blowdown	kgal	4,711	4,937	-4.58%	15,186	20,806	-27.01%
Calc # Cycles		6.26	4.76	31.46%	5.64	3.97	41.94%
Steam	kgal	2,003	2,544	-21.27%	11,904	12,582	-5.39%
Total Fuel Use	mmBTU	112,634	98,637	14.19%	583,510	520,454	12.12%
Natural Gas	mmBTU	112,634	98,637	14.19%	583,411	520,118	12.17%
Propane	mmBTU	0	0	0.00%	99	336	-70.54%
Condensate Return	kgal	8,259	6,440	28.25%	41,585	34,565	20.31%
	lbs	67,360,796	52,524,490	28.25%	339,158,575	281,907,772	20.31%
Avg Temp	°F	184.0	184.0	0.00%	181.7	182.0	-0.18%
Sendout							
Chilled Water	tonhrs	19,380,000	18,539,800	4.53%	62,904,100	67,646,900	-7.01%
Steam	lbs	82,770,000	72,975,000	13.42%	427,398,000	380,071,000	12.45%
Peak CHW Demand	tons	17,408	17,533	-0.71%	17,800	20,016	-11.07%
Peak Steam Demand	lb/hr	95,500	75,688	26.18%	150,565	136,250	10.51%
CHW LF		50.97%	48.42%	5.28%	40.34%	38.58%	4.57%
Steam LF		39.68%	44.15%	-10.11%	32.40%	31.84%	1.76%
Sales							
Chilled Water	tonhrs	18,663,706	17,610,598	5.98%	59,914,456	64,118,937	-6.56%
Steam	lbs	66,098,969	55,924,271	18.19%	366,927,696	321,508,409	14.13%
Losses							
Chilled Water	tonhrs	716,294	929,202	-22.91%	2,989,644	3,527,963	-15.26%
Steam	lbs	16,671,031	17,050,729	-2.23%	60,470,304	58,562,591	3.26%
		20.14%	23.37%	-13.80%			
Degree Days							
CDD		795	607	30.97%	2,078	2,201	-5.59%
HDD		296	152	94.74%	3,387	2,485	36.30%

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

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

GMQ Calculations	Unit	Fourth FY18	Fourth FY17	*Percent Difference	Total Year FY18	Total Year FY17	*Percent Difference
Steam							
GMQ Elec Conversion	kWhr/Mlb	6.00	6.00		6.00	6.00	
Electric Conversion	kWhr/Mlb	2.91	3.09	-5.60%	2.77	2.99	-7.55%
GMQ Plant Efficiency	Dth/Mlb	1.659	1.679		1.667	1.676	
Plant Efficiency	Dth/Mlb	1.361	1.352	0.68%	1.365	1.369	-0.30%
Actual %CR		81.38%	71.98%	13.07%	79.35%	74.17%	6.99%
Avg CR Temp	°F	184	184	0.00%	182	182	-0.18%
GMQ Water Conversion	gal	2,172,745	2,883,585		12,442,031	13,841,318	
Water Conversion	gal	2,023,030	2,569,440	-21.27%	12,023,040	12,707,820	-5.39%
Chilled Water							
GMQ Elec Conversion	kWhr/tonhr	1.055	1.055		1.055	1.055	
Electric Conversion	kWhr/tonhr	0.891	0.883	0.86%	0.900	0.886	1.58%
GMQ Water Conversion	gal/tonhr	5.25	5.25		5.25	5.25	
Water Conversion	gal/tonhr	2.09	2.00	4.38%	2.12	2.02	4.82%

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

D. Operating Costs

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

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

The system operating costs for FY17 to date are \$19,315,661. This value represents approximately 91.5% of the total budgeted operating cost for FY18 and includes expenses to date that have been invoiced but were not paid at the time of this report. Additional invoices that would be charged toward the Fourth Quarter expenses have not been issued or paid at the time of this report. The customer revenues from the sales of steam and chilled water for FY18 are \$17,085,852 which is approximately 88% of the budgeted amount. The MFA transferred to date is \$1,690,300 (100% of budget). However, the actual MFA required cannot be accurately calculated due to the outstanding invoices.

Table 3. DES Expenses and Revenues to Date

Item	FY18 Budget	First Quarter Expenses	Second Quarter Expenses	Third Quarter Expenses	Fourth Quarter Expenses	Total Spending to Date	% of Budget
Operating Management Fee							
FOC: Basic	\$ 4,460,400	\$ 1,107,516	\$ 1,107,516	\$ 1,107,516	\$ 1,107,516	\$ 4,430,063	99.32%
9th Chiller	\$ 41,800	\$ 10,378	\$ 10,378	\$ 10,378	\$ 10,378	\$ 41,510	99.31%
C/O 6A	\$ 82,500	\$ 20,489	\$ 20,489	\$ 20,489	\$ 20,489	\$ 81,954	99.34%
C/O 6B	\$ 72,200	\$ 17,937	\$ 17,937	\$ 17,937	\$ 17,937	\$ 71,747	99.37%
C/O 7	\$ 27,200	\$ 6,757	\$ 6,757	\$ 6,757	\$ 6,757	\$ 27,029	99.37%
C/O 8	\$ 11,800	\$ 2,957	\$ 2,957	\$ 2,957	\$ 2,957	\$ 11,829	100.24%
Pass-thru Charges:							
Chemical Treatment	\$ 166,400	\$ 56,099	\$ 86,180	\$ 51,714	\$ 49,059	\$ 243,052	146.07%
Insurance	\$ 37,700	\$ -	\$ 20,588	\$ -	\$ 4,754	\$ 25,342	67.22%
Marketing:							
CNE Sales Activity	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Incentive Payments	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
FEA:							
Steam	\$ 69,329	\$ 18,061	\$ 32,304	\$ 41,322	\$ 20,877	\$ 112,563	162.36%
Chilled Water	\$ 177,828	\$ 126,951	\$ 60,728	\$ 50,123	\$ 107,822	\$ 345,624	194.36%
Misc:							
Metro Credit	\$ -	\$ (220,872)	\$ (148,142)	\$ (101,479)	\$ (155,492)	\$ (625,985)	n.a.
ARFA	\$ 64,800	\$ 16,085	\$ 16,085	\$ 16,085	\$ 16,085	\$ 64,340	99.29%
Deferral	\$ -	\$ -	\$ -	\$ (84,007)	\$ (128,699)	\$ (212,706)	n.a.
Subtotal - Man Fee =	\$ 5,211,957	\$ 1,383,229	\$ 1,381,917	\$ 1,241,270	\$ 1,235,931	\$ 5,242,347	100.58%
Reimbursed Management Fee + Chem Treatment		\$ 1,414,684	\$ 1,329,874	\$ 1,241,270	\$ 1,235,931	\$ 5,221,759	0.00%
Metro Costs							
Pass-thru Charges:							
Engineering	\$ 9,600	\$ 6,648	\$ 4,272	\$ 769	\$ 2,969	\$ 14,658	152.69%
EDS R&I Transfers	\$ 275,300	\$ 68,825	\$ 68,825	\$ 68,825	\$ 68,825	\$ 275,300	100.00%
Metro Marketing	\$ 10,600	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Project Administration	\$ 36,300	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Metro Incremental Cost	\$ 578,400	\$ 135,897	\$ 115,081	\$ 134,171	\$ 257,781	\$ 642,929	111.16%
Utility Costs:							
Water/Sewer	\$ 565,800	\$ 207,514	\$ 128,731	\$ 88,079	\$ 134,899	\$ 559,223	98.84%
EDS Water/Sewer	\$ -	\$ 131	\$ 124	\$ 572	\$ 255	\$ 1,082	n.a.
EDS Electricity	\$ -	\$ 13,358	\$ 19,493	\$ 13,399	\$ 20,649	\$ 66,900	n.a.
Electricity	\$ 5,888,500	\$ 1,842,726	\$ 952,545	\$ 778,241	\$ 1,503,615	\$ 5,077,127	86.22%
Natural Gas Consultant	\$ 102,000	\$ 3,000	\$ 3,000	\$ 3,000	\$ 8,000	\$ 17,000	16.67%
Natural Gas Transport	\$ -	\$ 55,190	\$ 90,346	\$ 107,241	\$ 66,025	\$ 318,802	n.a.
Natural Gas Fuel	\$ 3,135,800	\$ 261,475	\$ 510,059	\$ 619,172	\$ 314,213	\$ 1,704,919	54.37%
Propane	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Subtotal - Metro Costs =	\$ 10,602,300	\$ 2,594,764	\$ 1,892,475	\$ 1,813,470	\$ 2,377,231	\$ 8,677,940	81.85%
Subtotal - Operations =	\$ 15,814,300	\$ 3,977,993	\$ 3,274,392	\$ 3,054,740	\$ 3,613,161	\$ 13,920,287	88.02%
Debt Service							
2012 Bonds	\$ 3,484,400	\$ 870,463	\$ 871,313	\$ 871,313	\$ 871,313	\$ 3,484,400	100.00%
2005 Bonds -Self Funded	\$ 731,200	\$ -	\$ -	\$ 731,225	\$ -	\$ 731,225	100.00%
2007 Bonds -Self Funded	\$ 193,000	\$ 157,275	\$ -	\$ 35,725	\$ -	\$ 193,000	100.00%
2008 Bonds -Self Funded	\$ 192,400	\$ 157,275	\$ -	\$ 35,125	\$ -	\$ 192,400	100.00%
2010 Bonds -Self Funded	\$ 192,800	\$ 157,275	\$ -	\$ 35,525	\$ -	\$ 192,800	100.00%
MCCC Fund -Self Funded	\$ 680,000	\$ 157,275	\$ -	\$ 208,175	\$ 314,550	\$ 680,000	100.00%
Interest & Misc Revenue	\$ (175,100)	\$ (12,332)	\$ (14,434)	\$ (21,267)	\$ (30,418)	\$ (78,450)	44.80%
MIP	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Oper. Reserve Fund	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Subtotal - Capital =	\$ 5,298,700	\$ 1,487,231	\$ 856,878	\$ 1,895,820	\$ 1,155,445	\$ 5,395,374	101.82%
Total =	\$ 21,113,000	\$ 5,465,224	\$ 4,131,271	\$ 4,950,560	\$ 4,768,606	\$ 19,315,661	91.49%
Customer Revenues							
Taxes Collected		\$ 99,571	\$ 81,801	\$ 79,335	\$ 88,813	\$ 349,520	n.a.
Taxes Paid		\$ 99,571	\$ 81,800	\$ 79,335	\$ 88,813	\$ 349,519	n.a.
Penalty Revenues/Credits		\$ (45,292)	\$ (29,907)	\$ 1,717	\$ 20,155	\$ (53,327)	n.a.
Energy Revenues Collected		\$ 4,806,890	\$ 4,089,965	\$ 3,920,767	\$ 4,321,556	\$ 17,139,178	n.a.
Revenues =	\$ 19,422,700	\$ 4,761,598	\$ 4,060,058	\$ 3,922,484	\$ 4,341,711	\$ 17,085,852	87.97%
Metro Funding Amount =	\$ 1,690,300	\$ 703,626	\$ 71,212	\$ 1,028,076	\$ 426,895	\$ 2,229,809	131.92%

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	\$ 3,749,912	19,215,465	\$ 0.1952	\$ 1,442,405	99,640	\$ 14.4761
State Government	\$ 3,346,892	13,769,352	\$ 0.2431	\$ 1,780,812	114,929	\$ 15.4949
Metro Government	\$ 4,985,310	26,929,639	\$ 0.1851	\$ 1,836,383	152,359	\$ 12.0530
New Customers	\$ 3,225,144	17,698,285	\$ 0.1822	\$ 1,299,002	122,858	\$ 10.5732
Total	\$ 12,082,113	59,914,456	\$ 0.2017	\$ 5,059,600	366,928	\$ 13.7891

Total Revenue \$ 17,141,713
 True-up and Adjustments (Net) \$ (55,861)
 Net Revenue \$ 17,085,852

III. EGF Operations

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

A. Reliability

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

- Due to an incident outside of CNE's control in April at the Renaissance Hotel, a break in the chilled water piping caused the chillers at the EGF to trip due to a low chilled water pressure.
- Due to blasting at the Peabody Plaza Site across the street from the EGF in May, a transformer tripped causing the EGF to lose electric power for approximately 30 minutes. Within approximately two and half hours, the chilled water temperature and steam pressures were back to normal.
- During the transfer of operating boilers in June, the steam pressure dropped below 150 psig for approximately 30 minutes.

B. Efficiency

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

C. Environment, Health and Safety

No environmental violations were reported during the quarter.

Monthly safety meetings were held on the Personal Protective Equipment (PPE), Chemical Safety and Emergency Preparedness.

D. Personnel

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

E. Training

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

F. Water Treatment

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

- Steam System
 - The condensate return averaged approximately 81.4% of the steam sendout during the quarter, which represents a 13.1% increase over the previous Fourth Quarter.
 - Feedwater iron and hardness remained excellent during the quarter.
- Condensing Water System
 - The conductivity of the condensing water continues to be normal with only a few excursions resulting in high cycles of concentration and low blowdown rates.
- Chilled Water System
 - CNE continues to monitor and test for the presence of bacteria in the system. The continuous dosage of the biocide continues. At this point, the biological growth in the system, as measured at the EGF and at the customer buildings, has become essentially non-existent.
 - CNE and TEG have reviewed and discussed the proposal to install a side stream filter to the chilled water system. This project is 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.

- Repaired plant lighting and electrical equipment
- Repaired and performed PM on chemical treatment equipment
- Replaced seals and bearings on BFWP 1, 2 and 3
- Replaced motor cooling fans on BFWP 1 and 3
- Completed repairs on garbage bin enclosure
- Replaced CT level controllers
- Repaired CT 14 vibration switch
- Repaired control room AHU
- Replaced belts on CTs
- Repaired leak in propane vaporizer
- Other repairs, maintenance and preventative maintenance were made during the quarter and are listed in the monthly reports issued by CNE.

Based on the 14th Year Audit, CNE has to provide the remaining three years of maintenance costs for the EGF. These costs are anticipated in the First Quarter FY19.

H. EGF Walk-through

A quarterly Walk-through of the EGF was performed on June 26, 2018, by Kevin Jacobs, P.E. with TEG. This review involved a tour of the facility with the primary points of interest and concern noted herein.

- During the Fourth Quarter FY17 Walkthrough report, it was noted that additional rust spots were observed on towers #1, #5, #6, #11, #16 and #18. CNE has not made the repairs on the riser tubes. In addition, cooling tower fill is still being stored on the cooling tower deck beneath the basins. Since the entire fill is reported to have been replaced, the remaining fill should be removed.
- CNE has made an effort to remove cobwebs within the EGF; however, this removal process is ongoing.
- The fencing surrounding the garbage dumpster in the parking lot was replaced during the Third Quarter and was painted during the Fourth Quarter.
- In the previous Walkthrough report, it was noted that significant scale was observed on the fill to cooling tower #14. The scale remains on this cooling tower and most of the cells along the west-side of the plant now have significant scale or deposits on the fill. CNE does not appear to have addressed this issue since the last Walkthrough report.

- An additional leak in the propane vaporizer was discovered by CNE during the quarter. They are in the process of repairing it.
- Scaling on the cooling tower fill on the east-side of the plant is present but less significant than on the west-side. The fill in cooling tower #1 appears to be more brittle than the others and has some broken or damaged pieces that the other cells do not appear to have. TEG recommends that CNE address the potential water chemistry issues that may be present to cause the scaling and determine if water chemistry is related to the brittleness.
- The leaking drain valve on the condensing water header on the northeast corner of the cooling tower deck was not leaking during the Fourth Quarter Walkthrough, however, the drain piping was not connected and a plug has not been installed in the valve.
- A leaking chemical feed line was observed on the south side of the southern DA during the Second Quarter Walkthrough. CNE has not addressed the issue or cleaned the area.
- The vent line for the northern DA is leaking at what appears to be a braided hose. There were also leaks in the copper piping from the drain lines from the DA vents. CNE stated that they were aware of these leaks and will repair them
- Green biological growth was noted to be present on the insides of the cooling towers and some plants were noted growing the basin for CT#3. CNE stated that they will address these issues and plan on cleaning the basins after the peak cooling season.
- 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 FY18 Open Projects

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

1. DES111 – DES Combined Heat and Power

This project is currently on hold.

2. DES119 - Chilled Water System Delta T Issue

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

3. DES124 - Criminal Justice Center Redevelopment

The Work associated with the reconnection to the DES for the CJC has been completed. CNE will deliver the metering equipment to the building's contractor for their installation when the contractor is ready to install it. TEG is preparing a second reimbursement request to submit to Metro General Services for the costs incurred by DES due to the demolition and re-construction of the CJC.

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

4. DES130 – Repair to Manhole B3

Construction was completed during the Third Quarter FY17. After failed attempts to receive reimbursement from the contractor which caused the damage, TEG turned the matter over to Metro's legal department. Since then, reimbursement has been received from the contractor's insurance company.

5. DES133 – Old Convention Center Site Redevelopment

Negotiations continue between the new owner of the site and Metro for the acceptance of the customer service agreement. Issues with the language of the easement for access to the Broadway tunnel from the new parking garage at 5th and Broadway were resolved during the quarter. The easement agreement is expected to be executed in the First Quarter FY19.

The blasting and hoe-ramming adjacent to the Broadway tunnel was completed at the development site during the Third Quarter FY18. Additional blasting on the north side of the site (away from the Broadway Tunnel) was completed early in the Fourth Quarter FY18. Therefore, the DES seismographs were removed from the Broadway tunnel early in the Fourth Quarter FY18.

TEG conducted a walk-through of the tunnel with their structural engineer and a representative from the contractor that reinforced the tunnel on March 28, 2018. Damage to some of the tunnel structure and piping support elements was documented. Fortunately, the damage is not major, but repairs will be needed. TEG presented a report on these findings along with an estimated repair cost during the Fourth Quarter FY18.

The 5th and Broadway development team has proposed constructing an NES vault on the north side of Broadway above the Broadway Tunnel. Since the proposed vault is extremely deep and will be within just a few feet of the ceiling of the

Broadway tunnel, TEG has concerns about maintaining the structural integrity of the tunnel. In addition, the intersection of the Bridgestone service tunnel and the Broadway tunnel is within the footprint of this proposed vault. The ceiling of this intersection is notably higher than the ceiling of the Broadway tunnel, thus it is possible that the proposed NES vault will actually interfere with this intersection.

TEG and their structural engineer met with the engineers and the 5th and Broadway site contractor in late June to discuss the NES vault design, its potential impact on the Broadway Tunnel and the potential interference between the proposed vault and the tunnel intersection. The 5th and Broadway development engineers are re-evaluating their design and intend on presenting TEG with their solutions to the problems discussed. TEG will continue to monitor this situation.

6. DES135 – CHW Leak at 5th and Union

After several exploratory excavations, the source of the chilled water leak at the James K Polk Building has not been located. Even though the repair of the leak at the intersection of 3rd and Charlotte has reduced the system make-up, the search continues for the source of the chilled water leak near the James K Polk Building.

7. DES139 – DES Options Review

Work began on the evaluation of the long-term options for the DES in the First Quarter FY18. A final report was issued by FVB during the quarter. Metro Finance Department is reviewing their options with the new mayor.

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

The insulation in these manholes is either non-existent or is in need of repair; therefore, this project addresses the replacement and/or installation of the needed insulation. Due to unexpected expenses associated with the reinforcement of the Broadway tunnel, this work remains on hold.

9. DES144 – Manhole 6 Repair

The structural steel piping supports in this manhole have experienced severe corrosion due to water infiltration and require replacement/repair to insure the structural integrity of the steam and condensate piping system. TEG has met with coating specialists and reviewed this manhole with them. TEG developed design documents for the needed repairs based on recommendations from the coating specialists. The steam and condensate will have to be isolated at this manhole to complete this work. A pre-bid meeting is scheduled for early First Quarter FY19.

10. DES146– Ryman Auditorium Steam Meter Replacement

This project was closed during the Fourth Quarter FY18 and Metro is waiting on final invoicing.

11. DES147 – Repair of Steam Pipe Insulation in 3rd Avenue North

A contractor for AT&T damaged the pre-insulated steam pipe which serves the Parkway Towers on 3rd Avenue North. The damage includes the pipe outer casing and insulation. CNE and TEG met the contractor that caused the damage on the site. TEG developed a scope and design to repair the damage and a pre-bid meeting was conducted during the Third Quarter FY18. Bids were received and the work was awarded and completed during the Fourth Quarter FY18. Final invoicing has been submitted. TEG has sent a reimbursement request to the contractor on behalf of the Metro.

12. DES148 – 10 Lea Ave/Rolling Mill Hill Site

Due to the blasting at the site directly south and across Peabody Street from the EGF, TEG hired a vibration consultant to install seismographs at the EGF to monitor the magnitude of the vibrations caused by the blasting. TEG and CNE are diligently monitoring the activity and remaining in contact with the blasting company to ensure the safe and continued operation of the EGF.

13. DES149 – Hot Spot at 1st and Molloy

As a result of CNE’s monthly thermographic survey, increases in temperature at a hot spot at the corner of 1st Avenue and Molloy Street were noted. Additionally, steam was evident from a curb inlet located at this corner. Based on TEG’s request, the Metro Water Services checked the area but did not find evidence of a city water leak. Therefore, TEG instructed CNE to conduct an exploratory excavation to determine the reason for the hot spot. This exploratory excavation took place during the Fourth Quarter FY18, and the pre-insulated steam piping was discovered to have experienced severe corrosion which resulted in groundwater infiltration and secondary steaming. Repairs for this section of pre-insulated steam piping were completed during the Fourth Quarter FY18.

B. Fourth Quarter FY18 Closed Projects

DES146 was closed during the Fourth Quarter FY18.

C. Capital Projects Budget

The following table summarizes the costs and remaining balance of the DES capital projects based on reported expenditures to date. Open projects or completed projects that

require some additional management are shown. Total costs for projects that are closed are shown with a gray highlight. Only the funds currently available are shown.

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

Table 5. Capital Projects Expense Summary

DES Project #	Description	Total Budget	FY18 Spending to Date	Total Spent to Date	Remaining Balance
Fund-49109					
DES119	DES Delta T Issue	\$ 67,000	\$ -	\$ 65,447	\$ 1,553
DES139	Options Review	\$ 63,600	\$ (1,270)	\$ 0	\$ 63,600
MAS	Miscellaneous Development Projects	\$ 46,900	\$ 25,243	\$ 26,999	\$ 19,901
	Total Closed Projects	\$ 2,493,661	\$ -	\$ 2,405,553	\$ 88,108
	Metro Project Admin	\$ -	\$ -	\$ -	\$ -
	Project Man, Development, etc	\$ (65,246)	\$ -	\$ -	\$ (65,246)
	Total 2010 Bond	\$ 2,605,916	\$ 23,973	\$ 2,497,999	\$ 107,917
Fund-49107					
DES124	CJC Redevelopment	\$ 300,000	\$ 215,677	\$ 357,868	\$ (57,868)
DES130	MH B3 Repair	\$ 20,000	\$ (11,001)	\$ 1,468	\$ 18,532
DES133	NCC Development	\$ 40,000	\$ 198,789	\$ 212,086	\$ (172,086)
DES133.3	Broadway Tunnel Reinforcement	\$ 450,000	\$ 435,523	\$ 435,523	\$ 14,477
DES134	401 Union Hotel Reconnection	\$ 60,000	\$ 2,268	\$ 52,991	\$ 7,009
DES135	Chilled Water Leak 5th and Union	\$ 200,000	\$ 16,511	\$ 177,756	\$ 22,244
DES138	MH-D	\$ 130,000	\$ 107,763	\$ 121,242	\$ 8,758
DES141	EGF Security Camera Upgrade	\$ 50,000	\$ 39,655	\$ 39,655	\$ 10,345
DES148	89 Peabody	\$ 10,000	\$ 25,079	\$ 25,079	\$ (15,079)
	Total Closed Projects	\$ 7,348,827	\$ -	\$ 6,871,398	\$ 477,429
	Metro Project Admin	\$ (129,827)	\$ 31,426	\$ 171,140	\$ (300,967)
	Project Man, Development, etc	\$ 21,000	\$ -	\$ -	\$ 21,000
	Customer Connection Fund	\$ 8,500,000	\$ 1,061,691	\$ 8,466,205	\$ 33,795
Fund-49116					
DES111	DES CHP	\$25,984,277	\$ -	\$ 168,706	\$25,815,571
	Total Closed Projects	\$ 15,723	\$ -	\$ 15,723	\$ -
	Metro Project Admin	\$ -	\$ -	\$ -	\$ -
	Project Man, Development, etc	\$ -	\$ -	\$ -	\$ -
	CHP and EDS Repairs	\$26,000,000	\$ -	\$ 184,429	\$25,815,571

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 \$104,285. Tables 6A and 6B provide a summary of the FY18 expenditures and revenues to date associated with the R&I budget.

Table 6A. Repair and Improvement Expenditure and Revenue Summary (First and Second Quarters FY18)

Description	Date	Tracking #	Vendor	Expenditure	Transfers	Net Market Adjustment	Market Value	Balance
Value at end of FY17						\$ -	\$ 26,260.82	\$ 26,260.82
Interest/Transfer	7/3/2017	-	-	\$ 9.64				
Interest/Transfer	7/3/2017	-	-	\$ (9.64)				
CNE June R&I Invoice	8/21/2017	DES-2320	CNE	\$ 2,677.12				
CNE May R&I Invoice	6/30/2017	-	CNE	\$ 4,672.28				
DES-140	8/31/2017	DES-2322	TEG	\$ 543.53				
DES-142	8/31/2017	DES-2322	TEG	\$ 3,596.49				
DES-143	8/31/2017	DES-2322	TEG	\$ 2,294.26				
Interest/Transfer	8/1/2017	-	-	\$ 21.29				
Interest/Transfer	8/1/2017	-	-	\$ (21.29)				
CNE July R&I Invoice	8/15/2017	DES-2322	CNE	\$ 1,978.44				
Interest/Transfer	9/1/2017	-	-	\$ 34.51				
Interest/Transfer	9/1/2017	-	-	\$ (34.51)				
			Sub-Total First Quarter	\$ 15,762.12	\$ 68,825.01	\$ -	\$ 53,062.89	\$ 53,062.89
DES-140	10/03/17	DES-2530	TEG	\$ 170.20				
DES-142	10/03/17	DES-2530	TEG	\$ 950.88				
DES-143	10/03/17	DES-2530	TEG	\$ 177.90				
Interest/Transfer	10/02/17	-	-	\$ 43.84				
Interest/Transfer	10/02/17	-	-	\$ (43.84)				
CNE Aug R&I Invoice	10/01/17	DES-2530	CNE	\$ 7,676.52				
DES-142	11/28/17	DES-2327	TEG	\$ 88.95				
DES-144	11/28/17	DES-2327	TEG	\$ 650.00				
Interest/Transfer	11/01/17	-	-	\$ 54.29				
Interest/Transfer	11/01/17	-	-	\$ (54.29)				
Sept R&I Invoice	11/01/17	DES-2327	CNE	\$ 9,464.47				
DES-144	12/27/17	DES-2329	TEG	\$ 1,292.42				
DES-145	12/27/17	DES-2329	TEG	\$ 814.93				
Interest/Transfer	12/01/17	-	-	\$ 68.81				
Interest/Transfer	12/01/17	-	-	\$ (68.81)				
Oct R&I Invoice	12/01/17	DES-2329	CNE	\$ 15,954.05				
DES-142 Bobby Hotel Steam Valve	12/01/17	DES-2329	CNE	\$ 6,618.00				
			Sub-Total Second Quarter	\$ 43,858.32	\$ 68,825.01	\$ -	\$ 24,966.69	\$ 24,966.69

Table 7B. Repair and Improvement Expenditure and Revenue Summary (Third and Fourth Quarters FY18)

Description	Date	Tracking #	Vendor	Expenditure	Transfers	Net Market Adjustment	Market Value	Balance
DES-144	01/30/18	DES-2331	TEG	\$ 617.28				
DES-145	01/30/18	DES-2331	TEG	\$ 1,045.38				
Interest/Transfer	01/02/18	-	-	\$ 89.71				
Interest/Transfer	01/02/18	-	-	\$ (89.71)				
Nov R&I Invoice	01/01/18	DES-2331	CNE	\$ 7,526.19				
Dec R&I Invoice	02/01/18	DES-2333	CNE	\$ 5,067.96				
DES-145	04/24/18	DES-2338	CNE	\$ 17,900.00				
Jan R&I Invoice	03/01/18	DES-2338	CNE	\$ 2,439.99				
DES-143	02/26/18	DES-2333	TEG	\$ 416.50				
DES-144	02/26/18	DES-2333	TEG	\$ 2,564.20				
DES-145	02/26/18	DES-2333	TEG	\$ 41.65				
Interest/Transfer	02/01/18	-	-	\$ 119.25				
Interest/Transfer	02/01/18	-	-	\$ (119.25)				
Feb R&I Invoice	04/01/18	DES-2338	CNE	\$ 6,510.01				
DES-140	04/01/18	DES-2338	CNE	\$ 4,730.00				
DES-144	03/26/18	DES-2335	TEG	\$ 4,562.74				
DES-146	03/26/18	DES-2335	TEG	\$ 3,471.98				
DES-147	03/26/18	DES-2335	TEG	\$ 2,932.73				
DES-149	03/26/18	DES-2335	TEG	\$ 424.35				
Interest/Transfer	03/01/18	-	-	\$ 125.38				
Interest/Transfer	03/01/18	-	-	\$ (125.38)				
Mar R&I Invoice	04/19/18	DES-2546	CNE	\$ 742.86				
Sub-Total Third Quarter				\$ 60,993.82	\$ 68,825.01	\$ -	\$ 7,831.19	\$ 7,831.19
DES-144	04/26/18	DES-2338	TEG	\$ 2,610.64				
DES-146	04/26/18	DES-2338	TEG	\$ 928.09				
DES-147	04/26/18	DES-2338	TEG	\$ 3,264.40				
DES-149	04/26/18	DES-2338	TEG	\$ 3,615.90				
DES-150	04/26/18	DES-2338	TEG	\$ 2,224.88				
Interest/Transfer	04/02/18	-	-	\$ 157.25				
Interest/Transfer	04/02/18	-	-	\$ (157.25)				
April R&I Invoice	05/17/18	-	CNE	\$ 5,622.40				
DES-144	05/26/18	DES-2546	TEG	\$ 208.25				
DES-146	05/26/18	DES-2546	TEG	\$ 405.59				
DES-147	05/26/18	DES-2546	TEG	\$ 1,095.55				
DES-149	05/26/18	DES-2546	TEG	\$ 428.28				
DES-150	05/26/18	DES-2546	TEG	\$ 3,239.98				
Interest/Transfer	05/01/18	-	-	\$ 175.04				
Interest/Transfer	05/01/18	-	-	\$ (175.04)				
DES-135	05/18/18	DES-2338	CNE	\$ 32,926.16				
DES-135 correction	06/05/18	-	-	\$ (32,926.16)				
May R&I Invoice	06/20/18	-	CNE	\$ 3,627.33				
DES-136	06/25/18	DES-2546	CNE	\$ 2,238.03				
EMR17004	06/25/18	DES-2546	CNE	\$ 28,956.04				
DES-143	06/30/18	-	TEG	\$ 166.60				
DES-144	06/30/18	-	TEG	\$ 2,720.55				
DES-146	06/30/18	-	TEG	\$ 182.30				
DES-147	06/30/18	-	TEG	\$ 420.43				
DES-149	06/30/18	-	TEG	\$ 711.98				
DES-150	06/30/18	-	TEG	\$ 115.30				
Interest/Transfer	06/01/18	-	-	\$ 201.68				
Interest/Transfer	06/01/18	-	-	\$ (201.68)				
DES-147	07/18/18	-	CNE	\$ 4,798.75				
DES-146	07/18/18	-	CNE	\$ 6,450.00				
DES-146	07/18/18	-	CNE	\$ 1,368.90				
June R&I Invoice	07/18/18	-	CNE	\$ 1,261.04				
Sub-Total Fourth Quarter				\$ 76,661.21	\$ 68,825.01	\$ -	\$ (7,836.20)	\$ (7,836.20)
FY18 Year to Date				\$ 197,275.47	\$ 275,300.04	\$ -	\$ 104,285.39	\$ 104,285.39

B. Preventive Maintenance

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

1. EDS Manhole Inspections
 - a. The monthly vault and tunnel inspections were held as scheduled.
 - b. 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. Lighting/electrical repairs are needed in some of the manholes.
 - f. 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 2018 walkthrough was conducted on June 12 and 14, 2018. The manholes that were visited included A, B, B5, K, L, M, N1, N2, S5, S6 and 15. The following comments and observations are a result of these visits:

1. Manhole A
 - a. There was water present in this manhole and it required pumping before 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. TEG contacted the painting inspector and the paint manufacturer that participated in that project. The painting inspector has written records documenting the preparation, application and environmental conditions, yet the paint manufacturer claims that the cause of the failure is related to preparation and application. TEG is investigating alternate paint from different manufacturers for future projects. TEG has asked for a repair specification

from the paint inspector; TEG will follow up on this and once the specifications are received, TEG will put together a repair scope for CNE to initiate repairs.

- d. The O-ring seal on the OD of both of the Fiberlite manway lids are frayed and need to be replaced. TEG made contact with the supplier and forwarded model number, local supplier and pricing information to CNE. CNE should order the replacement seal and install it as soon as possible. **This item appeared on last year's report and requires immediate action.**

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 on last year's report 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.

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 reposition 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 recently 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 open an R&I project for this insulation repair. CNE should obtain quotes for this repair and present them to TEG for approval. The quotes should include matching the existing insulation on the dripleg and the use of Pyrogel XT insulation on the trap piping.
- d. The seal on the large Fiberlite manway lid is frayed and needs to be replaced. The lid OD is 33"; the frame OD is 38". TEG made contact with the supplier and forwarded model number, local supplier and pricing information to CNE. CNE should review the condition of both manway lid O-rings and order the needed replacement seal(s) and install as soon as possible. **This item appeared on last year's report and requires immediate action.**
- e. 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. However, there is some corrosion on the edges some of the baseplates. TEG will contact the paint inspector to determine a repair

specification/strategy for this corrosion. Once received, TEG will put together a repair scope for CNE to initiate repairs.

4. Manhole L

- a. There was not any appreciable water in this manhole.
- b. There is some corrosion of the structural components in this manhole, especially on the north side of the anchor beam, on the west side where a strut penetrates the manhole floor. TEG will prioritize the extent of the corrosion in this manhole, and coordinate with CNE to have these metal surfaces cleaned and painted. CNE should open an R&I Project number for corrosion repairs in this manhole and other manholes.
- c. There is some minor insulation damage that should be repaired on the steam piping that penetrates the north manhole wall. CNE should determine if this is a repair that they can accomplish and report to TEG. If CNE cannot accomplish this repair, CNE should open a R&I Project number for this repair and obtain quotes and present them to TEG for approval. **This item appeared on last year's report and requires immediate action.**
- d. The traps in this manhole are Armstrong Series 20XX which CNE is in the process of replacing due to poor reliability. CNE should replace these traps as soon as possible. **This item appeared on last year's report and requires immediate action.**
- e. There are 3 traps in this manhole and none of the strainers ahead of the traps have blowdown valves. CNE should add blowdown valves to these strainers as soon as possible. **This item appeared on last year's report and requires immediate action.**
- f. While reviewing this manhole, a water/steam hammer event occurred in the condensate piping from Manhole 18. It is not known whether this event coincided with the start/shut-down of the condensate return pumps in Manhole 18. TEG informed CNE about this hammer event and CNE conducted an investigation. CNE's investigation found that the cause of the hammering is due to the starting/stopping of Manhole 18's condensate return pumps. TEG will research a remedy for this problem. CNE should open an R&I Project number for this investigation and any modifications that may be needed.
- g. 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 painted. CNE should open an R&I Project number for the corrosion repair in this manhole and other manholes.

- c. The exterior of the northeast corner of the manhole concrete roof has some cracking around the manway opening. CNE should fill these cracks with concrete crack filler before fall and freezing precipitation occurs. **This item appeared on last year's report and requires immediate action.**
 - d. The southern interior wall was recently repaired. Some hairline cracks have developed in the newly installed concrete. CNE should monitor these cracks and notify TEG of any significant changes.
 - e. The trap in this manhole is an Armstrong Series 20XX which CNE is in the process of replacing due to poor reliability. CNE should replace this trap as soon as possible. **This item appeared on last year's report and requires immediate action.**
 - f. The strainer upstream of the steam trap does not have a blowdown valve. CNE should add a blowdown valve to this strainer as soon as possible. **This item appeared on last year's report 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 condensing is causing some corrosion. Therefore, the non-insulated piping in this manhole should be insulated. TEG has developed specifications to have CNE bid and hire a contractor to have this manhole insulated. This project is "on hold" pending approval of Fiscal Year 2019's budget. TEG will notify CNE when this project can proceed and will present a scope and specifications at that time.
 - c. The piping supports in this manhole have surface corrosion and should be wire wheeled, cleaned and painted with cold galvanizing paint to prevent further corrosion. CNE should have this work completed prior to the next quarterly review of this manhole.
7. Manhole N2
- a. There was water present in this manhole and the manhole had to be pumped prior to entry.
 - b. The CHW isolation valves and a small portion of the 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. TEG has developed specifications to have CNE bid and hire a contractor to have this manhole insulated. This project is "on hold" pending approval of Fiscal Year 2019's budget. TEG will notify CNE when this project can proceed and will present a scope and specifications at that time.
8. Manhole S5
- a. No deficiencies to report.

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. TEG has discussed with CNE the installation of powder insulation in this manhole. This project is “on hold” pending approval of Fiscal Year 2019’s budget. TEG will notify CNE when this project can proceed and will present a scope and specifications at that time.

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’s customer representative should make contact with someone at the Symphony and obtain a key to these padlocks allowing CNE access when the need arises.

11. Manhole 15
 - a. Neither of the two lights is working. CNE should make repairs as soon as possible.
 - b. There is a small breach in the insulation on the eastern chilled water pipe coming up from the 4th Ave Tunnel. Condensate is dripping from this breach. The breach is in the horizontal run at the seam between the horizontal pipe and the elbow. CNE should repair this as soon as possible. **This item appeared on last year’s report and requires immediate action.**
 - c. There is some slight corrosion/flaking of the coating on the support beams in the sidewalk “entry area”. This corrosion is not extensive and CNE should clean these surfaces, remove any flaking or loose coating and paint them with cold galvanizing paint. CNE should have this work completed prior to the next quarterly review of this manhole.

Action Items

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

VI. Customer Relations

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

A. Marketing

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

Negotiations continued with the OMSE (new development for the old Convention Center) during the quarter. At this time, OMSE would only take 1,200 tons of chilled water capacity and do not require any steam. These loads result in a reduction of demand and income for the DES. OMSE has yet to accept their CSA with the DES.

A tenant of the 5th + Broadway development began discussions with TEG regarding the potential use of DES steam for a brewery during the Third Quarter. This tenant has decided to install their own boiler.

Conversations and meetings have been held with CB Ragland and others regarding the development of a new 253 room hotel to be constructed along Molloy Street between 2nd and 3rd Avenues South. It is believed that this hotel will require approximately 250 tons of chilled water, although, the discussions with the Owner's engineer have revolved around using 400 tons. Discussions and negotiations are in the early stages since this hotel is currently in the design phase.

B. Customer Interaction

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

- CNE's CSR was in contact with the personnel of several customer buildings to discuss leaks, building maintenance or building performance during the quarter.
- CNE's CSR met with several customers during the quarter to assist them in trouble-shooting heating or cooling issues present in their buildings.
- CNE's CSR and TEG met with Metro Library and Hume Fogg personnel to discuss potential issues related to their service due to blasting on the site across 7th Ave from the Library. CNE's CSR and TEG also reviewed the two mechanical rooms and made sketches in anticipation for developing a plan to serve the two buildings with temporary steam and chilled water should DES service be interrupted due to blasting along 7th Ave.
- CNE's CSR and TEG met with Viridian personnel to discuss the history of the DES service to the building and the prevalent cooling and control issues the building has had.

- Other minor issues and customer interactions are noted in the monthly reports from CNE.

VII. Recommendations

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

- Corroded structural steel within the vaults and tunnels should be cleaned and painted or replaced;
- 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 packing injection once the leak(s) is substantial enough to warrant repair.
- Lights in tunnels and/or manholes which are not functioning should be repaired or replaced as soon as possible.
- Minor concrete repairs need to be made in some manholes.
- Mud and debris needs to be cleaned and removed from some manholes.