

**Operations Monitoring Report  
First Quarter FY09**

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**October 27, 2008**

## **I. Executive Summary**

A review of the fiscal year 2009 (FY09) First Quarter performance and contract obligations between Nashville District Energy, LLC (CNDE) 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. Thus far in FY09, CNDE has satisfactorily met all of the contract obligations to Metro.

For the First Quarter FY09, the chilled water sendout decreased by approximately 11% over the previous First Quarter (FY08), and the sales decreased by approximately 11%. The number of cooling degree days decreased substantially over the same periods. The peak chilled water demand for the current quarter is 16,100 tons with a cooling load factor for the quarter of approximately 64%.

The steam sendout is approximately 2% lower this quarter than the previous First Quarter, and steam sales are up by approximately 8.5%. There were no heating degree days in the current quarter. Steam system losses were approximately 36% of the sendout which was approximately 15% less than in the previous First Quarter. The peak steam demand for the current quarter is 37,719 pounds per hour, which represents a 12.6% decrease from the previous First Quarter. The heating load factor for the quarter is approximately 52%, which is an increase of approximately 12% from the previous First Quarter.

The Energy Generating Facility (EGF) performance continues to surpass the System Performance Guarantee (Guaranteed Maximum Quantity or GMQ) levels. The chilled water and steam plant electric consumptions continue to perform considerably lower than the guaranteed levels. The steam plant fuel efficiency improved approximately 1% from the previous First Quarter. The total water consumption for the steam and chilled water plants has decreased approximately 8.3% from the previous First Quarter due to the extensive repairs to the chilled water and condensate return systems.

Work continued on DES Capital Projects during the First Quarter of FY09. For this quarter, only one FY07 project remained open, namely, DES 036 - 4<sup>th</sup> Ave Vent Fan and was an Repair & Improvement Project. Construction was substantially completed in the First Quarter FY09 on this project. Three FY08 Capital Projects were completed during the First Quarter and closed out. One additional FY 08 capital project was substantially complete during the First Quarter FY09 with close out expected to occur in the Second Quarter FY09. One FY09 project began and was substantially completed during the First Quarter FY09. The FY09 capital budget has not yet been approved, thus these capital projects are being funded by resources from the previous years' capital budget accounts. Repair and Improvements to the EDS continue as scheduled.

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## II. Energy Distribution System Sales and Performance

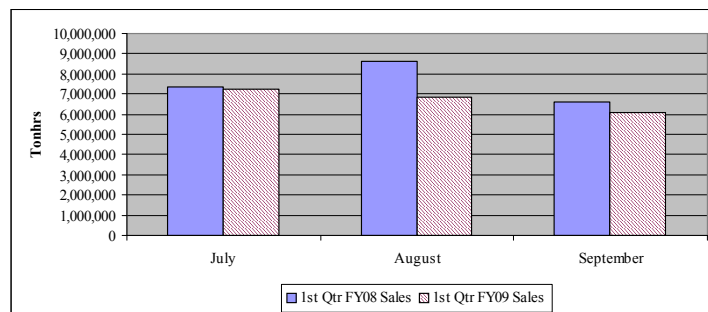
This section of the report discusses and presents performance information regarding the operation of the EGF for the periods described. Charts and tabular data are also presented to provide a more detailed description of the actual EGF performance.

### A. Chilled Water

#### 1. Sales and Sendout

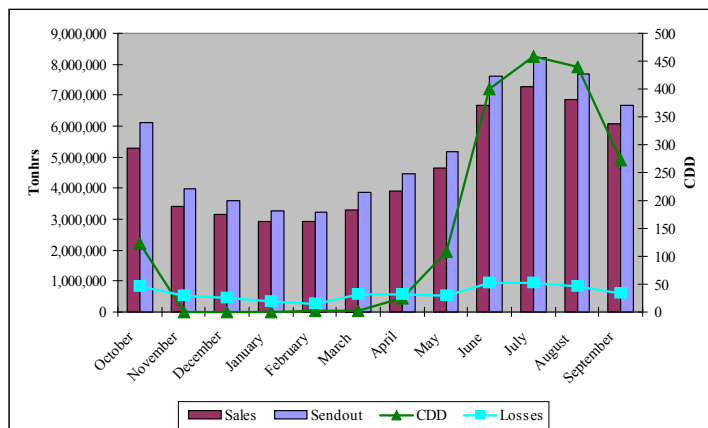
A comparison for the First Quarter chilled water sales is shown in Figure 1. This data reflects a decrease in sales for the current quarter over the same quarter of the previous fiscal year. The decrease in sales may be largely attributed to a decrease in the number of cooling degree days for the quarter and the implementation of energy savings programs by several key customers.

The peak chilled water demand for the current quarter is 16,100 tons. The cooling load factor for the current quarter, relative to sendout, is approximately 63.5% and is slightly less than in the previous First Quarter.



**Figure 1. First Quarter FY09 Chilled Water Sales**

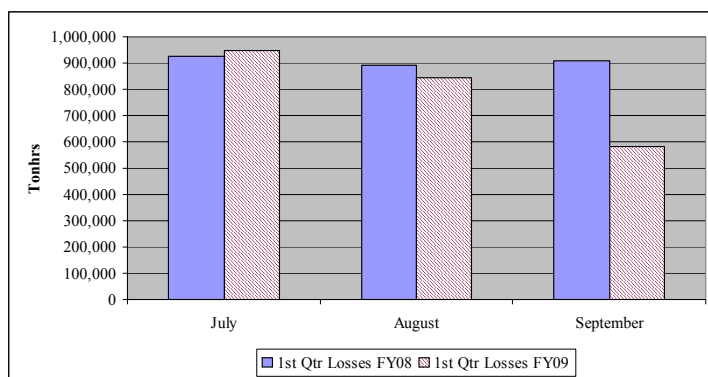
Figure 2 shows the chilled water sales, sendout and losses for the previous twelve months. The losses on this figure are defined as the difference in tonhrs per month between the recorded sendout and sales values and represent the total energy loss for chilled water in the EDS. The number of cooling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



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

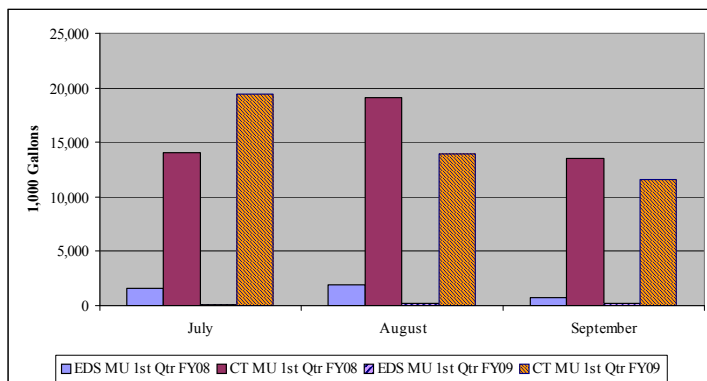
## 2. Losses

A comparison of the total, chilled water energy losses in the EDS for the First Quarter is shown in Figure 3. These losses are the difference in chilled water sendout and sales. The energy loss is caused by a combination of the loss in the mass of chilled water and a net heat gain into the chilled water piping. The increase in supply temperature between the EGF and the customers is typically less than 1°F.



**Figure 3. First Quarter FY09 Chilled Water Loss Comparison**

The mass loss to the EDS is reflected in the amount of city water make-up (MU) to the system. A decrease in the mass loss is noted with a comparison between the First Quarter data for FY08 and FY09 of approximately 88%. The overall decrease in make-up to the chilled water system is approximately 11% as shown in Figure 4.

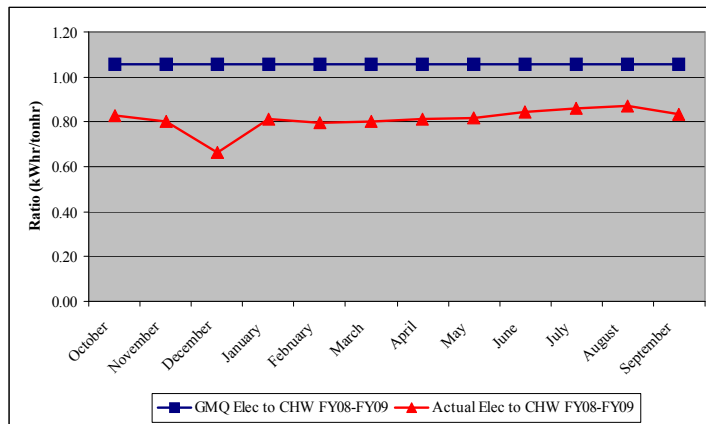


**Figure 4. Chilled Water System City Water Usage Comparison**

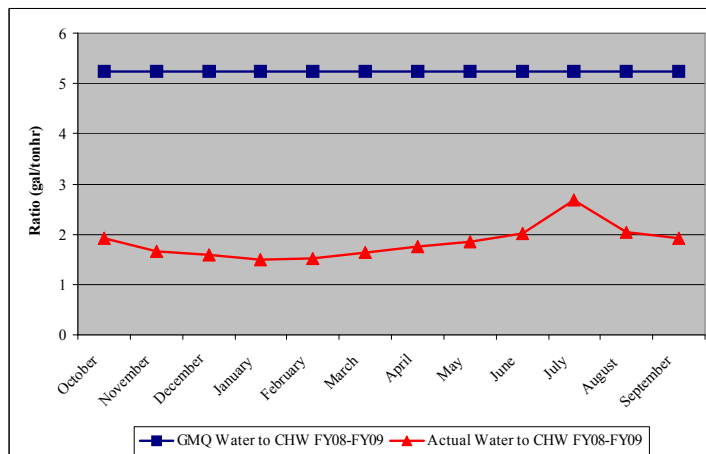
In the operation of a cooling tower, the majority of make-up water required is due to the evaporation of the circulating cooling water. The balance of the make-up is due to the blow down of the tower required by the levels of concentration of particulates and other contaminants entrained in the circulating water. The ratio between the amount of make-up due to evaporation and due to blowdown is referred to as the cycles of concentration. The recorded data for this quarter suggests that the plant operated with an average of 5.7 cycles throughout the quarter. This average number is approximately 11% higher than in the previous First Quarter, indicating an improvement in the water chemistry at the cooling tower.

### 3. Performance

The performance of the chilled water aspect of the EGF is presented by the following two charts, Figures 5 and 6, for FY09. Under the management of CNDE, the System Performance Guarantee levels as described in the ARMA are being achieved quite satisfactorily.



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



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

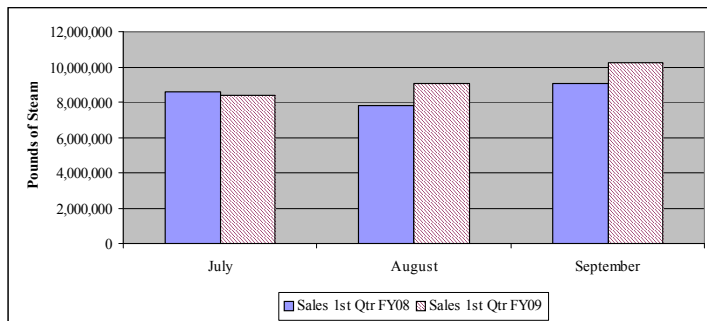
The chilled water allocation of the electric consumption falls under the GMQ limit of 1.055 kWhr per tonhr for the current quarter, and no excursion is reported for the current fiscal year. The electric usage for the current quarter decreased approximately 12% over the First Quarter for FY08. The actual chilled water plant water conversion factor is approximately the same as in the First Quarter of FY08. The consumption of city water for the chiller plant for the current quarter is approximately 10.5% less than that for the previous First Quarter.



B. Steam

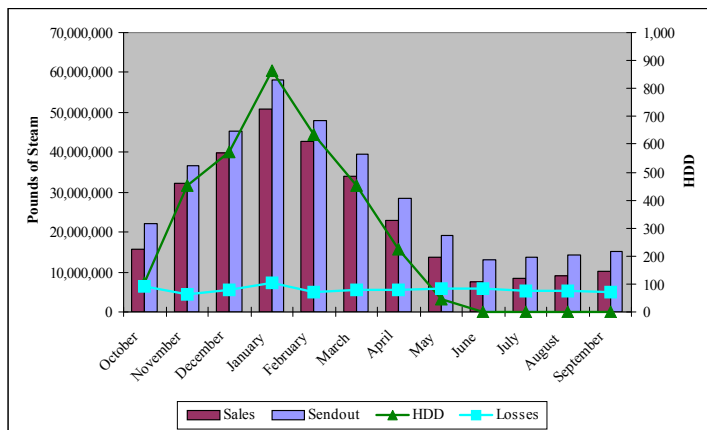
1. Sales and Sendout

The steam sendout decreased by approximately 2% for the current quarter over the previous First Quarter (FY08), and the sales increased by approximately 8.5%. A decrease in sendout and increase in sales implies that the steam system losses have decreased. In fact, the steam system losses decreased by approximately 17%. There were no heating degree days this quarter. A comparison for the First Quarter steam sales is shown in Figure 7.



**Figure 7. First Quarter FY09 Steam Sales Comparison**

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.

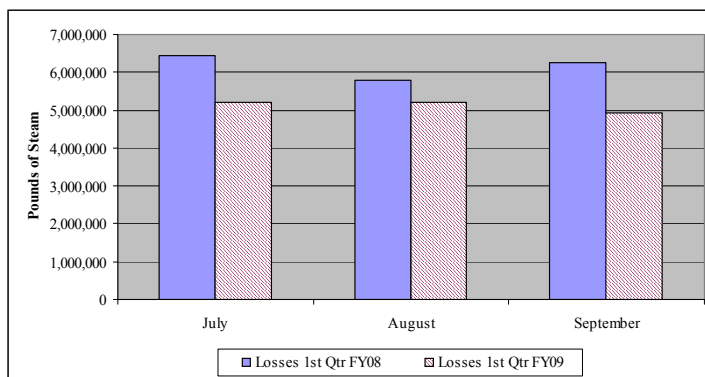


**Figure 8. Steam Sales, Sendout, Losses and HDD for the Previous Twelve Months**

The peak steam demand for the current quarter is 37,719 pounds per hour, which is approximately 13% less than the peak demand for the previous First Quarter. The heating load factor for the current quarter, relative to sendout, is approximately 52% and represents an increase in the load factor over the previous First Quarter.

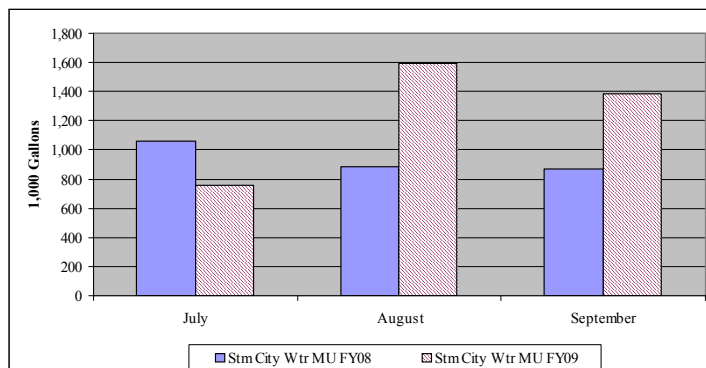
## 2. Losses

A comparison of the total steam mass losses in the EDS for the First Quarter is shown in Figure 9. The mass loss is caused by the heat loss in the EDS between the EGF and the customer meters, resulting in a mass loss at steam traps. Faulty traps, steam leaks or meter error could also be a contributing cause of these losses. The total losses for the current quarter are approximately 17% less than in FY08.



**Figure 9. First Quarter FY09 Steam Loss Comparison**

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

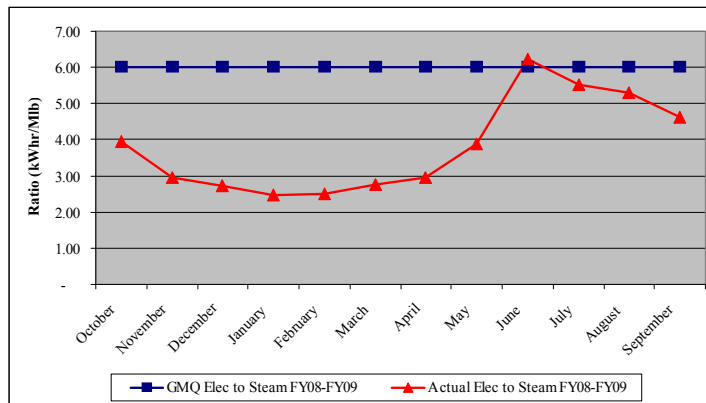


**Figure 10. First Quarter FY09 Steam System Make-up Comparison**

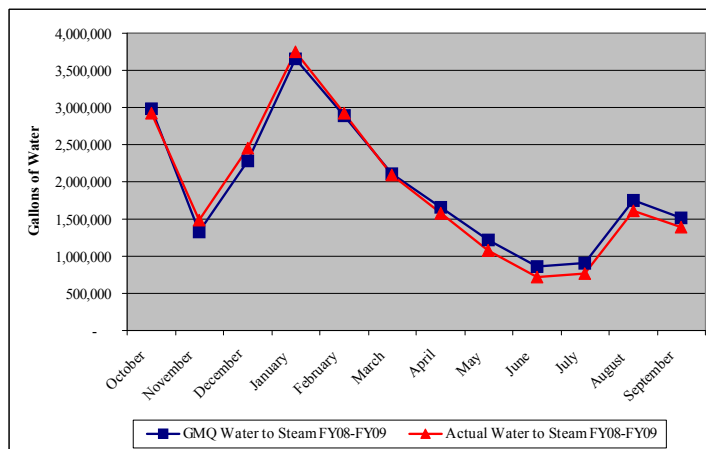
Figure 10 depicts an increase in city water make-up to the steam system of approximately 33% for the current quarter. This increase in make-up is primarily due to a decrease in condensate return to the EGF of approximately 44%. During the quarter, the iron content of the condensate return began to increase which prompted CNDE to dump the condensate in the EDS to prevent contamination to the EGF boilers and equipment.

### 3. Performance

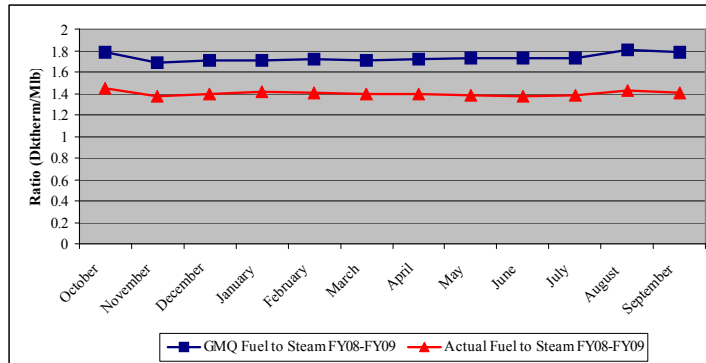
The performance of the steam system aspect of the EGF is presented by the following three charts, Figures 11, 12 and 13. Under the management of CNDE, the System Performance Guarantee levels as described in the ARMA are being achieved satisfactorily except for a single excursion in the electric consumption in June 2008. The fuel consumptions remain below the GMQ for the quarter. The electric usage for the current quarter is approximately 14% less than in the previous First Quarter.



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



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



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

C. Contract Guarantee Performance

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

**Table 1. First Quarter FY09 Production, Sales and Consumption Summary**

	Unit	First Quarter FY09	First Quarter FY08	*Percent Difference
	days	92	92	0.00%
<b>Total Electric Use</b>	kWhrs	17,404,589	19,724,315	-11.76%
Chilled Water	kWhrs	17,262,842	19,573,305	-11.80%
Steam	kWhrs	141,747	151,010	-6.13%
<b>Total Water Use</b>	kgal	49,277	53,719	-8.27%
Total Chilled Water	kgal	45,544	50,908	-10.54%
EDS Make-up	kgal	517	4,233	-87.79%
Cooling Towers	kgal	45,025	46,675	-3.54%
Calc CT Evaporation	kgal	38,275	39,016	-1.90%
CT Blowdown	kgal	6,750	7,659	-11.87%
Calc # Cycles		5.67	5.09	11.31%
Steam	kgal	3,733	2,811	32.78%
<b>Total Fuel Use</b>	mmBTU	60,587	62,344	-2.82%
Natural Gas	mmBTU	60,579	62,344	-2.83%
Propane	mmBTU	8	0	N/A
<b>Condensate Return</b>	kgal	1,647	2,964	-44.46%
	lbs	13,428,608	24,176,386	-44.46%
Avg Temp	°F	158.0	177.0	-10.73%
<b>Sendout</b>				
Chilled Water	tonhrs	22,566,100	25,339,600	-10.95%
Steam	lbs	43,003,000	43,990,000	-2.24%
Peak CHW Demand	tons	16,100	17,400	-7.47%
Peak Steam Demand	lb/hr	37,719	43,156	-12.60%
CHW LF		63.48%	65.96%	-3.75%
Steam LF		51.63%	46.17%	11.85%
<b>Sales</b>				
Chilled Water	tonhrs	20,193,715	22,612,523	-10.70%
Steam	lbs	27,673,379	25,504,124	8.51%
<b>Losses</b>				
Chilled Water	tonhrs	2,372,385	2,727,077	-13.01%
Steam	lbs	15,329,621	18,485,876	-17.07%
		35.65%	42.02%	-15.17%
<b>Degree Days</b>				
CDD		1,170	1,491	-21.53%
HDD		0	0	NA

\*positive percent difference values imply an increase from FY08 to FY09

**Table 2. First Quarter FY09 Performance Guarantee for Steam and Chilled Water**

GMQ Calculations	Unit	First Quarter FY09	First Quarter FY08	*Percent Difference
<b>Steam</b>				
GMQ Elec Conversion	kWhr/Mlb	6.00	6.00	
Electric Conversion	kWhr/Mlb	5.12	5.92	-13.49%
GMQ Plant Efficiency	Dth/Mlb	1.774	1.715	
Plant Efficiency	Dth/Mlb	1.409	1.417	-0.59%
Actual %CR		31.23%	54.96%	-43.18%
Avg CR Temp	°F	158	177	-10.73%
GMQ Water Conversion	gal	4,170,080	2,793,781	
Water Conversion	gal	3,770,330	2,839,544	32.78%
<b>Chilled Water</b>				
GMQ Elec Conversion	kWhr/tonhr	1.055	1.055	
Electric Conversion	kWhr/tonhr	0.855	0.866	-1.24%
GMQ Water Conversion	gal/tonhr	5.25	5.25	
Water Conversion	gal/tonhr	2.26	2.25	0.18%

\*positive percent difference values imply an increase from FY08 to FY09

### III. EGF Operations

Items relating to the facility operations presented herein are derived from the reports issued by CNDE for the months of July, August and September 2008. Communication between TEG and CNDE continues to be excellent, and CNDE has reported and managed all EGF operations satisfactorily and according to agreement.

#### 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. CNDE reported several disruptions in service during the quarter, but the duration of each was short and had negligible apparent effects on the customers. The reliability issues are summarized in this section.

- There were no excursions or outages during July or September.
- One excursion in chilled water temperature occurred on August 31 due to a power failure. A fault at a 69kW NES capacitor at the south substation caused the chiller plant equipment to trip at 6:40 p.m. The chilled water temperature rose to 50°F by 6:48 p.m. The equipment was restarted immediately, and the chilled water temperature was back down to 42.7°F by 8:00 p.m.

B. Efficiency

The operation of the EGF satisfied the guaranteed levels for all commodity usage during the quarter. There were no excursions above the guaranteed levels for the First 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. There were no employees reported to be on light duty and were no reported lost-time accidents during the quarter. Monthly safety meetings were conducted by HazMat, Inc., the American Red Cross and others.

An accident involving an SE-2 occurred during August. The person strained his shoulder opening a condenser water isolation valve on a chiller. The employee was sent for treatment. There was no lost time involved in this incident.

D. Personnel

The EGF currently has twenty-six full time employees. There were no personnel changes during the quarter.

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 city water make-up conductivity was consistently reported as being acceptable throughout the quarter. However, the chlorine levels were reported high on several occasions, but the sulfite injection system appears to be controlling chlorine levels prior to boilers.



- An increase in the iron levels at the boilers was noted on August 7. These levels exceeded 3.30 ppm and resulted in the condensate return being sent to drain until September 20. CNDE investigated the possible causes of this significant excursion and found that the problem could be related to the use of the old condensate return line between MH 5 and 9. This line was used while repairs to the condensate line between MH 6 and 23 were made.
- Iron levels continue to fluctuate at the testing locations at AA Birch and the Andrew Jackson (State Tunnel). High levels of iron were noted each month.
- 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.
  - A motor on a blowdown valve was replaced in August.
- Chilled Water System
  - The system control and chemistry continues to be excellent.

#### G. Maintenance and EGF Repairs

CNDE 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 motor bearings were replaced on #6 CHWP in July and the motor was re-aligned.
- The drive belts for CT 1, 2, 3, 4, 6 and 12 were replaced in July.
- A new softener controller for #3 softener was installed in July.
- Eyewash stations were installed at the CT level and on the Mezzanine level above the chillers in August.
- The valve on the steam blanket for #3 boiler was repaired in August.
- The backflow preventer was repaired in September.
- A leak on the #1 BFWP re-circulation line was repaired in September.
- Cooling tower cells, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 17 were pressure washed during the quarter, and the risers were primed and painted.
- Other minor repairs and maintenance were made during the quarter and are listed in the monthly reports issued by CEPS

#### H. EGF Walk-through

A quarterly Walk-through of the EGF was performed on September 23, 2008, by Kevin Jacobs, P.E. This review involved a tour of the facility with the primary points of interest and concern noted herein.

- The caution tape and safety padding on the cooling tower support beams at the south end of the cooling tower bay are missing or deteriorating. This item was noted in the previous quarter's walk-through and remains unaddressed.
- Numerous minor cracks in the outside concrete walls remain. No additional work has been performed on these cracks. No action is required at this time.
- The re-grading and sloping of the area at the west face of the EGF has not been completed. These repairs could help prevent further settling of the foundation and soil erosion. No action is required at this time.
- Empty boxes and paint are being stored in the electrical room. This item was noted in the previous quarter's walk-through and remains unaddressed.
- Boiler #1 lower drum was open due to a reported steam blanket leak.
- A refrigerant leak was reported in the log books in September on chiller #4. A further investigation revealed that CNDE responded quickly and appropriately to this matter. The leak was been repaired in September soon after its discovery.

#### IV. Capital Projects

The Capital Projects discussed in this section are those projects funded through the issuance of bonds by Metro. As of the end of the First Quarter, no funds have been appropriated for FY09. Projects planned for FY09 have been re-prioritized with FY08 projects not yet contracted. Costs for these projects will be paid from funds previously approved. The status of scheduling of the projects are discussed, and the project cost-to-date and bond balance are also presented.

##### A. First Quarter FY08 Open Projects

The following projects remained open at the end of the First Quarter of FY09.

##### 1. DES004 & 021 - Customer Metering (State and Metro Owned)

As a follow-up to the report issued on June 20, 2008, an amendment report was issued on October 1, 2008. This latter report addressed recent discoveries and additional review of the steam meters. It is believed that the software upgrade to the existing meters will not significantly improve the accuracy of the meters. Additional tuning may be performed by CNDE during their annual inspections of the meters to verify that the setup parameters are in agreement with the manufacturer's recommendations for the installations. The apparent errors associated with the meter

at Citizen's Plaza appear to have been caused by a faulty ground and was repaired during the First Quarter. No additional work is required. This project will be closed in the Second Quarter.

2. DES033 - Manhole Lid and Ring Replacement/Restoration

This project relates to the repair and replacement of manhole lids and rings whenever Metro Public Works performs street re-paving. No work was reported for this project during the First Quarter FY09. This project will remain open.

3. DES041 - Symphony Condensate Repair (Updated to DES 054)

The Symphony's condensate is currently being tempered with city water and discharged to the sewer system via Manhole B4. Prior to this condensate being tempered, it was reported to have damaged some sewer piping near Manhole B4 at its discharge point. TEG has completed a preliminary evaluation of the options available for disposal or recovery of the condensate. Based on the recovery of condensate from the Symphony and from the driplegs located in the three manholes along the route, combined with the potential damage which may occur to manhole structures due to the collection of condensate within vaults, a suitable payback exists to install a condensate return line from Manhole B4 to Manhole B. This new line will enable the recovery of the condensate from the Symphony and will also provide a means of recovery of condensate from the planned Convention Center.

The design of this condensate line was completed and issued for bid during the Fourth Quarter FY08. Bids were received early in the First Quarter FY09 and were reviewed and awarded. With this award, and due to the extensive research of potential solutions for the return or disposal of the Symphony's condensate, a new project number was assigned in order to separate this work from the prior investigations. This new project number is DES 054.

Construction began in the First Quarter FY09 and is scheduled to be substantially complete by the end of November 2008.

4. DES042 - 401 Union Street (formerly Regions Bank) Condensate Line Repair

Due to a previous failure, the condensate line between Manholes 3 and 4 was isolated, and the condensate from the steam traps in MH 4 was piped into the 401 Union Street (formerly Regions Bank) building where it was drained to the sewer. The condensate line into 401 Union Street had collapsed and was in need of replacement. Economic evaluations were performed regarding the repair of the condensate line between MH 3 and 4 to return the condensate to the EGF, however,

a favorable payback did not exist. Hence, because the condensate in the dripleg in Manhole 4 needs to be continuously drained, the condensate line into 401 Union Street needed be replaced. Therefore a project to replace the condensate line into 401 Union Street was designed, bid and awarded.

Work began on this project during the Fourth Quarter FY08. Some additions to the scope were made which included running vent piping from the basement of the 401 Union Street building to Manhole 4 along with the inclusion of a separate water meter for the tempering water. The cost of the tempering water will be billed directly to DES.

This project was completed early in the First Quarter FY09 and is now closed.

#### 5. DES044 - MH 5 to MH 9 Condensate Line Replacement

The condensate line between Manholes 5 and 9, located along 5<sup>th</sup> Avenue between Deaderick and Union Streets, has been isolated due to its poor condition. This segment of condensate line represents a portion of the “main condensate loop” within the downtown distribution system. The replacement of this section of the condensate return system will provide redundancy to enable the return of condensate to the plant from two directions, thus improving the reliability of the system.

As a result of additional research, the scope of this project may need to also include the repair or replacement of portions of the steam piping along this route. Therefore, the design for this project is currently on hold pending a re-evaluation of the project’s scope. Funding has been requested in the FY09 capital budget to cover costs relating to the potential for steam line replacement.

#### 6. DES045 - MH 6 to MH 23 Condensate Line Replacement and the Sheraton Hotel Condensate Service Line Replacement

Thermographic imaging of the condensate line between Manholes 6 and 23, located along Union Street between 6<sup>th</sup> and 7<sup>th</sup> Avenues, indicated that the line had potential leaks. This section of the condensate main receives condensate only from the Hermitage Hotel. However, with the condensate line between MH 5 and 9 out of service, the condensate return from the 501 Building would also be lost if the section of line between MH 6 and MH 23 were to go out of service. Because the thermographic survey only indicated one or two potential problem spots, in an attempt to avoid the replacement of all 400 feet of piping, a design was completed to perform a repair to a portion of this line and to perform inspections to determine the extensiveness of deterioration.

This repair was bid and awarded during the Fourth Quarter FY08 and construction took place early in the First Quarter FY09. A severely damaged section of the condensate return piping was revealed along with deterioration of insulation on approximately 50 linear feet of the adjacent steam main. The damaged section of the condensate piping was removed and a camera was sent through the pipe to try and determine the condition of the remaining piping. The camera revealed that additional damage exists in the remainder of the condensate piping, and it is in need of replacement. Rather than immediately pursue the replacement of this condensate piping, it was decided that it would be more cost-effective to develop a design for a new condensate line that would be placed at a minimum depth below the road surface. Based on this decision, the severely damaged section of condensate piping was repaired and the deteriorated steam piping insulation was replaced. The excavation was backfilled and the roadway repaired. This project will be closed and a “shallow bury” replacement condensate main will be designed to be constructed at a future date.

#### 7. DES046 - Ryman Auditorium Condensate Line

The condensate service line from the Ryman Auditorium to the main return line in 4<sup>th</sup> Avenue is in very poor condition and has been isolated. Due to this isolation, the condensate is currently being tempered with city water inside the Ryman Auditorium and then discharged to the Ryman’s sewer system. As described in prior quarterly reports, it was believed that due to the length of this service line, the return on the capital cost replacement was inadequate. Therefore, the preferred solution was to install a tempering station at the customer’s building to cool the condensate for disposal into the city sewer system. Based upon recently received bids on other DES projects, an adequate capital return might exist for the replacement of the condensate piping. Additionally, the Ryman representative’s response to the installation of a tempering station within the Ryman was not well received.

A utility survey was performed in the First Quarter, and TEG is currently designing a replacement of the existing condensate piping and will receive bids for this work. It is expected that the design and the bidding of this work will be completed during the Second Quarter of FY09. Upon the receipt of these bids, TEG will re-evaluate the most viable option.

#### 8. DES047 - State Steam Tunnel Condensate Line Replacement

An award for the replacement of approximately 400 feet of 2 inch condensate piping along with the replacement of eight (8) slip-type expansion joints was awarded and commenced during the Fourth Quarter FY08. This work was completed early in the First Quarter FY09 and is now closed.

9. DES048 - Tunnel Lighting & Electrical Upgrades Phase III

The lighting and some of the electrical system located in the Broadway, 4<sup>th</sup> Avenue and 7<sup>th</sup> Avenue distribution tunnels was in poor condition and presented a potential safety hazard to maintenance personnel. Therefore, a plan was developed to repair and replace the lighting and some electrical components in three phases over a three year period. The first two phases of this project have been completed, and the final phase is budgeted and scheduled to be replaced during this fiscal year. However, the sections of the tunnel system which this third phase addresses has experienced some structural degradation. Therefore, CNDE is currently evaluating the structural aspects of these tunnel sections through a third-party consultant. This third party consultant's evaluation report should be completed early in the Second Quarter FY09. This report will be reviewed and a course of action will be determined at that time. Once any needed repairs to these tunnel sections are made, this third phase of the lighting and electrical upgrades will proceed.

10. DES049 - Temporary Boiler Connection

Through the City of Nashville's evaluation of emergency planning, it was determined that there is a need to be able to supply heating to the inmates housed in the Metro Criminal Justice Center and Courthouses should the EDS steam system be out of service. This project included the installation of an emergency connection in an existing manhole to allow a temporary boiler to be connected to the northeastern section of the distribution system.

The design and bidding of this project was completed during the Fourth Quarter FY08 with construction beginning late in the quarter. The construction for this project was completed early in the First Quarter FY09. This project is now closed.

11. DES050 - Manhole & Tunnel Insulation Repair

Insulation in several of the manholes and some portions of the tunnels is in disrepair. Not only does this present a safety hazard to personnel, but it can also cause damage to manhole equipment, components and the manhole structure. The required work within these manholes has been prioritized, and a standard insulation specification has been completed. The receipt of bids for the repair and replacement of insulation in the higher priority manholes began during the Third Quarter FY08 with the award of three manholes.

The replacement/repair of insulation in three high priority manholes was awarded during the Third Quarter FY08 (Manholes B, M and 10). This insulation repair/replacement took place during the First Quarter FY09. Three additional high

priority manholes were bid during the First Quarter of FY09 with the receipt of these bids scheduled for early in the Second Quarter FY09. Once these bids are evaluated, an award will be made and work should take place during the Second Quarter of FY09. The work associated with this project will be ongoing as required.

12. DES051 - Expansion Joint Replacement - 4<sup>th</sup> Ave Tunnel

It has been determined that this project qualifies as a Repair & Improvement project and not a capital project. Therefore, it has been moved to the R&I category.

13. DES052 - Wildhorse Saloon Steam & Condensate Line Replacement

The condensate service line to the Wildhorse Saloon failed during FY07. In addition, CNDE has been monitoring a “hot spot” on the steam service line for several months. After a review of the condition and type of piping system serving this customer, it is anticipated that the steam line may also require replacement in the future. TEG completed the design for these modifications and bids were solicited for this project during the Second Quarter FY08. Bids were received late in the Second Quarter FY08 for replacing only the condensate line, however, the pricing was prohibitive for the project to move forward. Therefore, as a temporary solution, a tempering station has been designed to cool the condensate and dispose of the effluent to the sewer system. Meetings with the customer took place, and they were receptive to this approach. The tempering system design was issued for bid early in the First Quarter FY09, and was substantially complete during the same quarter. It is anticipated that all construction activities will be completed early in the Second Quarter FY 09.

14. DES055 - Rebuild of Manhole “C”

Manhole “C” is located on 5<sup>th</sup> Avenue North, between Charlotte Avenue and Gay Street. It is the last manhole within the district steam system which is constructed of steel. Because it is constructed of steel and it has been underground for 30+ years, it was in very poor condition and was listed on the FY09 capital projects. It is located in the driveway to the new MTA Bus Depot currently under construction and scheduled to open October 24, 2008. Because of its location, it was decided to move up the design and construction schedule for the rebuild of this manhole to the First Quarter FY09. Design and bidding for the replacement of this manhole with a concrete structure was completed during the First Quarter FY09 with construction scheduled for September 2008. Construction began September 4, 2008, and was substantially complete on September 29, 2008. A final punchlist and subsequent closeout of this project will be completed early in the Second Quarter FY09.



B. First Quarter FY09 Closed Projects

There were five projects closed during the Fourth Quarter FY08: DES 022, DES 042, DES 045, DES 047 and DES 049.

C. Capital Projects Budget

The following table summarizes the costs and remaining balance of the DES capital projects based on reported expenditures at the end of the First Quarter FY09. Open projects or completed projects that require some additional management are shown. Projects that were closed to date are shown with a gray highlight. The total, historic budget and expenditures of the 2002A Bond are not shown; the values shown only reflect the more recent projects and expenditures with the remaining project balance.



**Table 3. FY09 Capital Project and Bond Summary**

A. Bond Funds		Remaining Balance
2002A	As of 7/23/08	\$47,486
2005B	As of 7/23/08 includes MB Project Admin allocation	\$531,099
	DES 042 - Regions Bank Condensate Line (completed but not billed)	(\$176,097)
2007	As of 7/23/08	\$237,729
		\$640,216

**B. 2008 Capital Projects**

Priority	Project #	Description	Budget	Anticipated or Contracted Cost to Date	Potential Additional Cost	Total Anticipated Cost	Remaining Balance	Footnotes
COMPLETE	DES 047	State Steam Tunnel	\$325,000	\$56,567	\$0	\$56,567	\$268,433	1
COMPLETE	DES 049	Temp Boiler Connection MH 15	\$93,500	\$23,724	\$0	\$23,724	\$69,776	1
COMPLETE	DES 045	MH 6 to MH 23 & Sheraton CND Lines	\$700,000	\$96,270	\$0	\$96,270	\$603,730	1,3
IN CONSTR.	DES 050	MH & Tunnel Insulation Repair	\$100,000	\$101,664	\$0	\$101,664	(\$1,664)	1,2,4
COMPLETE	DES 053	Tunnel Mapping	not incl.	\$37,607	\$0	\$37,607	(\$37,607)	1,5
COMPLETE	DES 052	Wildhorse Stm & CND (Tempering)	\$150,000	\$22,594	\$0	\$22,594	\$127,406	1,6
IN CONSTR.	DES 054	Symphony Condensate	not incl.	\$933,809	\$0	\$933,809	(\$933,809)	2,7
	5 DES 046	Ryman Auditorium Cond Line	\$150,000	\$150,000	\$125,000	\$275,000	(\$125,000)	8
	6 DES 044	MH 5 to MH 9 Cond Line	\$550,000	\$327,000	\$0	\$327,000	\$223,000	9, 16
COMPLETE	DES 055	Rebuild Manhole C (incl. isolation valves)	\$0	\$242,113	\$25,000	\$267,113	(\$267,113)	1,10, 11
R & I	DES 051	Exp Jt Replacement 4th Ave At MH 17	\$240,000	\$0	\$0	\$0	\$240,000	12
	12 DES 048	Tunnel Lighting & Elec Ph III	\$90,000	\$90,000	\$0	\$90,000	\$0	13
		Proj. Mgmt & Contingency	\$350,000	\$6,596	\$22,092	\$28,688	\$321,312	
			\$2,748,500	\$2,087,944	\$172,092	\$2,260,036	\$488,464	
<b>Sub-total, Remaining Balance existing Bonds &amp; Remaining FY 08 Budget</b>							<b>\$1,128,680</b>	

**C. 2009 Capital Projects**

Priority	Project #	Description	Budget	Anticipated Cost	Total Anticipated Cost	Footnotes
1	tbd	Tunnel Rock Repair - mapping & repair	\$600,000	\$600,000	\$600,000	14
2	tbd	MH & Tunnel Structural Corrosion Prevention/Repair	\$250,000	\$250,000	\$250,000	15
-----	tbd	Rebuild Manhole C (incl. isolation valves)	\$500,000	\$0	\$0	16
7	tbd	MH & Tunnel Insulation Repair	\$100,000	\$100,000	\$100,000	
6	tbd	Replace Steam Piping MH 5 to MH 9	\$450,000	\$163,500	\$163,500	17
8	tbd	Replace STM & CND piping to Citizen's Plaza	\$250,000	\$150,000	\$150,000	
4	tbd	STM & CND Line Replacement M/H K to Wildhorse	\$400,000	\$196,500	\$196,500	18
3	tbd	Replace Main STM & CND valves in MH 13	\$75,000	\$75,000	\$75,000	19
9	tbd	Replace Bellows Joints in MH 23	\$75,000	\$75,000	\$75,000	20
11	tbd	De-couple J K Polk Bldg/address hydraulic problems	\$550,000	\$300,000	\$300,000	
10	tbd	MH 6 to 23 CND Line Replacement	\$400,000	\$400,000	\$400,000	21
13	tbd	Metering	\$200,000	\$0	\$0	
14	tbd	Additional EDS Division Valves	\$150,000	\$0	\$0	
		Proj. Mgmt & Contingency	\$250,000	\$250,000	\$250,000	
			\$4,250,000	\$2,560,000	\$2,560,000	
<b>Sub-total, Remaining Balance existing Bonds &amp; Remaining FY 08 Budget less anticipated FY 09 Projects</b>						<b>(\$1,431,320)</b>

**Footnotes:**

- 1 complete
- 2 under contract/in construction
- 3 repair was made to section of CND piping; remaining CND piping needs replacement with shallow bury; this add'l work added to 2009 Project list
- 4 MH U, B, M & 10 complete; MH L, 6 & 13 under contract
- 5 additional funds included in FY 09 budget to make repairs; might need to allocate portion of remaining FY 08 funds for repairs
- 6 funds were used for tempering station; additional funds included in 2009 budget for line replacement
- 7 previously DES 041;
- 8 in design; utility survey complete; awaiting add'l utility info from AT&T; will design and bid out to determine viability of construction
- 9 project might rise in priority due to Deadrick Street "Streetscape Project"; funds anticipated is realistic cost for CND; add'l funds incl. in 09 budget for stm
- 10 project moved from FY 09 list due to its proximity to the new Metro bus depot
- 11 awaiting final cost accounting from change authorizations
- 12 moved to Repair & Improvement budget
- 13 first two phases complete; Phase III is needed but awaiting tunnel rock repair before proceeding
- 14 mapping complete; funding will be needed for repairs
- 15 severe corrosion exists in some manholes; minor corrosion exists in most manholes
- 16 project moved to 2008 budget - see footnote 10
- 17 both STM & CND needs to be addressed; CND is shut down; thermographic pictures indicate that portions of steam is probably uninsulated
- 18 due to condition of Wildhorse manhole, existing piping and manhole should be abandoned in place & new piping installed
- 19 STM valve has leaked on numerous occasions; valve flanges and bonnet have numerous injection points from leak sealant
- 20 STM & CND each have bellows expansion joint installed

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

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

### A. Repairs and Improvements

Several repairs were made to the EDS and at customer buildings during the quarter. The items listed herein fall outside the scope of the DES Capital Projects. The remaining value of the R&I budget at the end of the First Quarter FY09 is \$415,280. Table 4 provides a summary of the FY09 expenditures and revenues associated with the R&I budget.

**Table 4. FY09 Repair and Improvement Expenditure and Balance**

Description	Date	Tracking #	Vendor	Expenditure	Transfers	Net Market Adjustment	Market Value	Balance
"Market Value" and "Cost Value" at end of FY08						\$ (526.25)	\$ 357,208.12	\$ 356,620.76
Manhole B2,B3, B4, and 4th Avenue Tunnel Vent for period of 6/29/08 - 8/02/08	08/12/08	DES-879	TEG	\$ 1,843.03				
Manhole B2,B3, B4, Expansion Joint Replacement and 4th Avenue Tunnel Vent for period of 8/3/08 - 8/30/08	09/08/08	DES-891	TEG	\$ 34.48				
<b>Sub-Total First Quarter FY09</b>				<b>\$ 1,877.51</b>	<b>\$ 59,972.49</b>	<b>\$ (22.93)</b>	<b>\$ 58,072.05</b>	<b>\$ 58,094.98</b>
<b>Sub-Total Second Quarter FY09</b>				<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>Sub-Total Third Quarter FY09</b>				<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>Sub-Total Fourth Quarter FY09</b>				<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
<b>FY 09 Year to Date</b>				<b>\$ 1,877.51</b>	<b>\$ 59,972.49</b>	<b>\$ (22.93)</b>	<b>\$ 415,280.17</b>	<b>\$ 414,715.74</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.

- EDS Tunnel and Manhole Inspections:
  - Rock continues to be in need of repair in the ceilings in the tunnels under Broadway and 7<sup>th</sup> Avenues. The recommendations from the geotechnical consultant received during the Third and Fourth Quarters FY08 were reviewed, and the need to "map" the tunnel as the initial stage of the design to make repairs was approved. "Mapping" of the tunnel was conducted during the First Quarter of FY09 and a report of the result of this mapping is

expected early in the Second Quarter FY09. This report will be reviewed and decisions regarding repairs will be made at that time.

- A condensate leak from the casing of the service lines to Ryman Auditorium is in need of repair.
- The impeller to the #2 tunnel sump pump was replaced in September.
- Several steam traps were replaced or repaired.
- State Tunnel Inspections:
  - A 6" ANSI class 250 steam isolation valve was replaced on August 6. No additional deficiencies or repairs were reported during the quarter.
- The determination of the energy consumptions based on monthly bills for a number of customers required reviews of their meter installations. The chilled water meter at the Renaissance Hotel was found to be in error, but was repaired in September.
- Additional thermographic inspections of the EDS revealed another new “hot spot” at 5<sup>th</sup> Avenue and Union Street. This hot spot is believed to be related to the temporary re-use of the condensate line between MH 5 and 9.
- The condensate return was drained beginning August 7 due to high iron content. The condensate return to the EGF was restored on September 20.
- Other minor items are included in the CNDE monthly reports.

#### C. Emergencies

CNDE did not report any emergencies with the EDS during the quarter.

#### D. EDS Walk-through

A quarterly “walk-through” of the energy distribution system was performed on September 23, 2008 by Jon Belcher, P.E. of TEG in order to help assess the overall condition of the system and also to note specific areas that may require maintenance, repair or replacement. The manholes visited included Manholes 1, 2, 3, 4, 5, 6, 6A, 10, U, and Wildhorse. The following comments and observations are a result of these visits. CNDE is provided with a list of the vault issues, and remediation of these issues are to be addressed under the EDS maintenance program.

- Manhole 1
  - There was no water within this manhole.
  - The steel structural components in the vault have experienced substantial corrosion.
  - There is some insulation requiring repair.
  - There is some spalling of the concrete roof and walls.
- Manhole 2
  - The steel structural components in the manhole have experienced substantial corrosion.

- There is a substantial amount of insulation requiring replacement/repair.
- The steam slip-type expansion joint has a small leak and should be repaired.
- There is some spalling of the concrete roof and walls.
- **Manhole 3**
  - This vault was inaccessible due to construction occurring in the southern lanes of Union Street; the inspection of MH 3 would have completely blocked Union Street at this location. A walkthrough of this manhole will be re-scheduled for later this fiscal year.
- **Manhole 4**
  - There was water present within this manhole that required pumping before entry.
  - The steel structural components in the vault have experienced substantial corrosion.
  - A pair of the access ladder wall supports are not attached to the manway wall. These brackets should be attached to the manway wall to provide additional support.
- **Manhole 5**
  - There was water present within this manhole that required pumping before entry.
  - There was a minor steam leak on a steam slip joint.
  - Some insulation requires repair.
  - The steel structural components in the vault have experienced substantial corrosion.
  - Some personnel safety related items need to be addressed in this manhole such as a ladder extension.
- **Manhole 6**
  - There was water present within this manhole that required pumping before entry.
  - The steel structural components in the vault have experienced substantial corrosion.
  - Some minor leftover construction debris exists and requires removal.
  - The link seal on one of the steam penetrations needs to be re-installed and properly set.
  - There is a leak at a condensate piping flange.
  - There is some spalling of the vault's concrete wall.
  - There is some insulation missing on the condensate sparge pipe.
- **Manhole 6A**
  - This “manhole” consists of two valve boxes.
  - Some personnel safety related items need to be addressed in this manhole such as ladder.
  - There is a substantial amount of insulation requiring replacement/repair.

- Manhole 10
  - This manhole was extremely warm; the cause for this heat needs to be investigated.
  - Some of the piping penetrations do not appear to have link seals
  - The steel structural components in the vault have experienced substantial corrosion.
- Manhole U
  - There was no water in this vault.
  - There is some minor debris in this manhole that should be removed.
- Wildhorse Manhole
  - There was water present within this manhole that required pumping prior to entry.
  - This manhole has experienced substantial deterioration since the last inspection report dated January 29, 2008.
  - The ladder is in very poor condition - this ladder constitutes a severe safety hazard and needs to be replaced.
  - There is a constant inflow of groundwater into this manhole.
  - If the service piping to/from the Wildhorse is replaced, this manhole will be abandoned.

## **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 27 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 CNDE in an excellent and professional manner.

### **A. Marketing**

- TEG, CNDE and Metro DES continue to monitor and remain involved with the progress associated with the development of the New Convention Center.
- A hydraulic analysis report was developed during the First Quarter and issued by TEG on October 8, 2008. This analysis indicates that the EGF and EDS are capable of serving approximately 11,500 gpm to the New Convention Center site. This additional flow rate will consume all of the remaining capacity at the EGF. However, the New Convention Center load is anticipated to be less than this value (~5,270 tons, undiversified).

B. Customer Interaction

- Several customers were trained on the use of the DAQ software and the operation of their C-Tech metering panels.
- An RTD failed at the Renaissance Office Complex and was replaced on July 8.
- A steam leak was reported to the management of the Ryman Auditorium on July 21. This steam leak occurred on the building-side of the system.
- Apparent cooling problems at the Metro Library were addressed in August and September by CNDE and TEG. These issues have apparently been resolved as a result of the implementation of recommendations made by TEG. Their return setpoint was returned to the contract value of 56°F in September.
- A meeting was held between the representatives of the State buildings, TEG and CNDE to discuss the hydraulic issues and excessive flow rates at several State buildings and along Union Street. No decisions required immediate actions were made. This meeting was held on August 28.
- CJC requested that their return setpoint remain less than the contract value until October.
- Minor customer issues or communications occurred with the Schermerhorn, Nashville City Center, Renaissance Office Complex and the Convention Center during the quarter.
- Other minor issues and customer interactions are noted in the monthly CNDE reports.

**VII. Recommendations**

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

- As mentioned in previous reports, further investigation is recommended regarding the addition of automated O<sub>2</sub>-trim to the boilers. This increase in automation may increase the fuel efficiency of the boilers and may have a relatively short return on investment. TEG will begin the investigation of the economic benefit related to this modification during the fiscal year. Only the customers receive the economic benefit for this investment, thus funding for such projects should be the responsibility of the customers.
- Due to the apparent soil erosion on the west face of the EGF, CNDE should determine if the terrain on the west side of the EGF needs regrading to prevent rainwater from flowing into and under the foundation wall. These repairs could help prevent further settling of the foundation and soil erosion. No action is required at this time.

- Cleaning, painting, replacement and repair of structural steel within manholes to reduce or eliminate corrosion will begin under a capital project line item similar to the Insulation Repair Project (DES 050).
- Insulation which is either not present or in disrepair within the manholes needs to be addressed through either additional capital projects, which include work within these manholes, or through DES 050.
- Potential safety hazards within some of the manholes and tunnel shafts need to be addressed.
- CNDE should continue to remove any debris present in the manholes as inspections and schedules allow.