

Alexandria Arlington Resource Recovery Facility

Fiscal Year 2018
Second Quarter Operations Report

February 2018



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Definition of Abbreviations & Acronyms

<u>Abbreviation/Acronym</u>	<u>Definition</u>
APC	Air Pollution Control
Apr	April
Aug	August
Avg	Average
Btu	British thermal unit
CAAI	Covanta Alexandria Arlington, Inc.
CEMS	Continuous Emissions Monitoring System
CO	Carbon Monoxide
Dec	December
ECOM	Emergency Communications
Feb	February
FMG	Facility Monitoring Group
FY	Fiscal Year
gal	Gallon
GAT	Guaranteed Annual Tonnage
HCl	Hydrochloric (Hydrogen Chlorides)
HDR	HDR Engineering Inc
HHV	Estimated Waste Heating Value (Btu/lb)
ID	Induced Draft
Jan	January
Jul	July
Jun	June
klbs	Kilo-pounds (1,000 lbs)
kWhr	Kilowatt hours (1,000 watt-hours)
lbs	Pounds
LOA	Letter of Agreement
Mar	March
Max	Maximum
May	May
Min	Minimum
MSW	Municipal Solid Waste
MWhr	Megawatt hours
No	Number
NOV	Notice of Violation
Nov	November
NO _x	Nitrogen Oxide
Oct	October
OSHA	Occupational Safety and Health Administration
PDS	Potomac Disposal Services
ppm	Parts per million
ppmdv	Parts per million dry volume
PSD	Prevention of Significant Deterioration
Q1	First Quarter
Q2	Second Quarter
Q3	Third Quarter
Q4	Fourth Quarter
RE	Reportable Exempt
RNE	Reportable Non-Exempt
SDA	Spray Dryer Absorber
Sep	September
SO ₂	Sulfur Dioxide
TCLP	Toxicity Characteristic Leaching Procedure
VADEQ	Virginia Department of Environmental Quality
WL	Warning Letter
yr	Year
YTD	Year to date

Alexandria/Arlington Waste-to-Energy Facility Second Quarter Operations Report – Fiscal Year 2018

1.0 Purpose of Report

HDR Engineering, Inc. (HDR) was authorized by the Facility Monitoring Group (FMG) to conduct quarterly inspections and provide quarterly reports regarding the operation and maintenance of the Covanta Alexandria/Arlington Waste-to-Energy Facility (Facility) for the 2017 calendar year. This report is prepared for the second quarter of the 2018 fiscal year and summarizes Facility operations between October 1, 2017 and December 31, 2017. This report identifies the fiscal year beginning on July 1, 2017 as FY18 and the quarter beginning on October 1, 2017 as Q2FY18.

This report is based upon HDR's experience in the waste-to-energy industry, upon site observation visits and previous reports provided by HDR, and upon data provided by Covanta Alexandria / Arlington, Inc. (CAAI), the Facility owner and operator.

2.0 Executive Summary

CAAI operated the Facility in an acceptable manner and in accordance with established waste-to-energy industry practices during Q2FY18. The operation of the Facility, maintenance, safety, and overall cleanliness continue to be above average. Environmental performance was acceptable with one (1) reportable environmental excursion throughout the quarter. Prior to the excursion, the Facility operated 1,415 days without an environmental permit deviation.

During Q2FY18, the boilers experienced eight (8) instances of unscheduled downtime totaling 338.2 hours, and the turbine generators experienced no unscheduled downtime. Boiler Nos. 2 and 3 experienced scheduled major outages totaling 242.3 hours of downtime during the quarter. Note that Boiler No. 1 completed a major outage last quarter (September). During the quarter, Boiler No. 3 experienced one (1) period of standby time totaling 7.0 hours, and

Turbine Generator No. 2 experienced 46.6 hours of standby time while Boiler Nos. 2 and 3 were down in November. Note that standby time is not factored into overall availability. A detailed listing of downtime is provided in Section 5.2 of this report.

Average waste processed during the quarter was 930.9 tons per day, or 95.5% of nominal facility capacity. Waste deliveries averaged 889.0 tons per day, which is 4.5% lower than the burn rate. The capacity utilization of 95.5% is excellent when compared to that of mature, well run waste to energy facilities.

Performance trends for various measurements are presented in Section 4. In general, the Facility continues to demonstrate reasonable consistency in month to month performance throughout the most recent three-year period tracked for detailed comparisons.

During the quarter, MSW processed slightly increased (less than 0.1%) from the corresponding quarter in FY17; steam production decreased (1.2%), and electricity generated (gross) decreased (2.1%) from the corresponding quarter in FY17. The decrease in steam generation is attributable to the decrease (1.8%) in waste heating value, paired with more boiler downtime (242 additional hours). The decrease in electricity generated (gross) in Q2FY18, is attributable to lower steam production, offset by less turbine generator downtime (57.1 fewer hours) experienced by the turbine generators.

3.0 Facility Inspection and Records Review

In November 2017, HDR met with the Facility management and other plant personnel to discuss Facility operations and maintenance, acquire data and reports, perform an independent visual inspection of the operating Facility, photograph areas of interest, and perform a review of recent Facility activity. This visit was coordinated with the scheduled FMG meeting. At the time of the inspection, HDR reviewed CAAI records, discussed performance issues with CAAI staff, and provided a verbal report addressing Facility conditions and

performance statistics at the November 2017 FMG meeting. HDR maintains a running tabulation of the status of corrective actions and plant performance trends. CAAI provides the following documents for each month:

- Facility Monthly Operating Reports
- Monthly Continuous Emissions Monitoring System (CEMS) Reports

Table 1 summarizes maintenance, repair, and plant condition issues reported during this and prior reporting periods. An “A” indicates an issue of the highest priority and worthy of immediate attention. Such items are usually safety or operability issues. A “B” indicates that the issue needs to be dealt with as quickly as possible, but is not urgent. These items will usually result in a process improvement or will help avoid future “urgent” issues. A “C” indicates that the issue should be dealt with at the earliest convenience, but is not a priority issue. This category might include issues related to aesthetics, non-urgent maintenance, or housekeeping improvements which are not safety related.

Note that HDR inspections are generally performed while equipment is operating, and are not intended to address the internal condition, performance or life expectancy of mechanical, electrical and electronic equipment and structures. HDR inspections are only performed quarterly, generally representing findings on the day of the inspection. CAAI is responsible, without limitation, for operations, maintenance, environmental performance and safety and should not rely on HDR observations or inspection reports which are overviews of Facility external conditions only.

Table 1: Summary of Inspection Report Deficiencies

*A is highest priority & demands immediate attention; B needs attention, but is not urgent; C can be addressed at earliest opportunity & is not urgent.

Item No.	Inspection Report Deficiencies	Issue Reported	Priority*	HDR Recommendation	Status	Open / Closed
1	Corrosion on ceiling panels in Turbine Generator Enclosure	August 2014	C	Sand, Prime, Paint and Preserve, and replace deteriorated panels as necessary	Complete	Closed
2	Pot hole, southeast corner of Ash Trailer Canopy	August 2015	C	Repair road surface	Status Unchanged	Open
3	Pavement spider-cracking at Tipping Floor Entrance	November 2016	C	Resurface section of pavement at Tipping Floor Entrance	Status Unchanged	Open
4	Concrete slab damaged that Citizen's Drop-off Roll-off is on	November 2016	C	Repair concrete slab	Status Unchanged	Open
5	Tipping Floor Center Bay concrete apron eroded and rebar exposed	February 2017	C	Resurface eroded section of Tipping Floor near refuse pit	Status Unchanged	Open
6	Ceiling panels deteriorated above Boiler Nos. 2 and 3	May 2017	C	Replace deteriorated ceiling tiles and conduct painting preservation measures	Status Unchanged	Open
7	Siding on north and east side of Facility dirty	May 2017	C	Pressure Wash Siding	Status Unchanged	Open
8	Viewport glass cracked on Boiler No. 3 Barn Door	May 2017	A	Replace viewport glass	Complete	Closed
9	Windshield cracked on Roll-off Truck No. 103	August 2017	A	Report to hauler contractor and monitor repair process	Status Unchanged	Open
10	Pressure wash of exterior siding needed at Charging Floor Elevation Above Service Elevator	August 2017	C	Pressure wash exterior siding	Status Unchanged	Open
11	Viewport damaged on 4 th Floor Elevation at the northwest corner of Boiler No. 1	August 2017	C	Repair viewport	Complete	Closed
12	SDA Penthouse No. 3 Door deteriorated at base — See Figure 1 (Appendix B)	November 2017	C	Patch and Paint Door – Replace if necessary	Status Unchanged	Open
13	Drainage pipe damaged and water build up against east wall of Tipping Floor — See Figure 2 (Appendix B)	November 2017	C	Repair drainage pipe and assure proper drainage in area near east wall of Tipping Floor	Status Unchanged	Open

4.0 Facility Performance

Monthly operating data provided by CAAI indicates that 85,642 tons of MSW were processed during Q2FY18, and a total of 81,787 tons of MSW including 4,531 tons of Special Handling Waste were received. Total ash production during the quarter was 17,350 tons, which represents 20.3% of the waste processed by weight. The average uncorrected steam production rate for Q2FY18 was 3.08 tons_{steam}/ton_{waste}, which is lower (1.2%) than the corresponding quarter in FY17. The decrease in this metric is attributable to the 1.8% decrease in the average waste heating value (HHV) calculated by CAAI.

Chart 1: Tons of Waste Processed

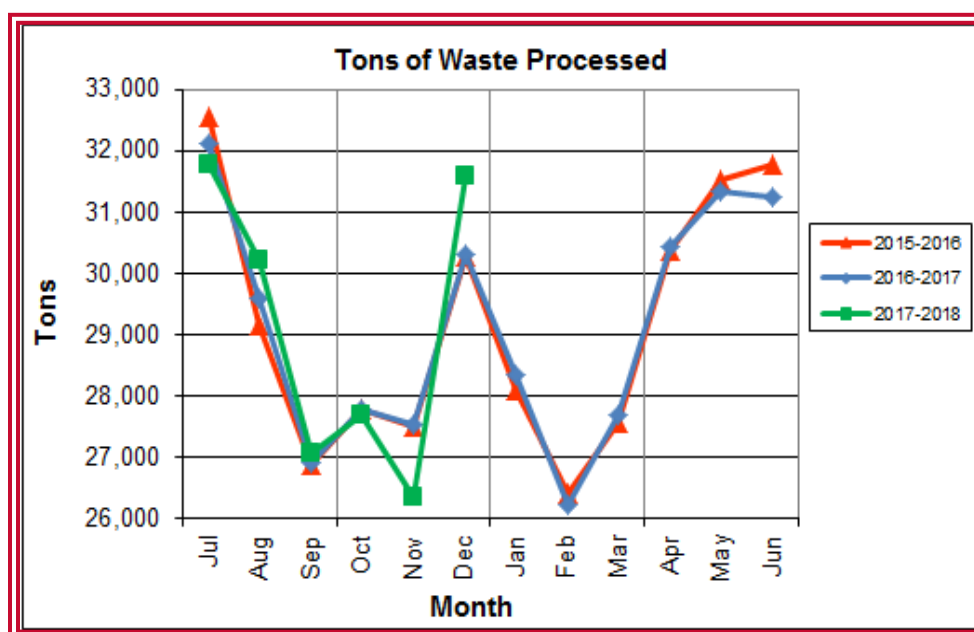


Chart 1 illustrates that Q2FY18 waste processed was slightly lower (0.7%) than the corresponding quarter, Q2FY17.

CAAI reported that 442 tipping floor/MSW internal inspections were conducted during the quarter and seven (7) notices of violation (NOVs) were issued to haulers for the following issues:

- October 2017 – Four (4) NOVs were issued for:
 - Two (2) NOVs for jumping in line
 - One (1) NOV for unacceptable material
 - One (1) NOV for not having turnbuckles latched on the truck

- November 2017 – No NOVs were issued
- December 2017 – Three (3) NOVs were issued for:
 - One (1) NOV for a load of brakes
 - One (1) NOV for speeding
 - One (1) NOV for a diesel leak

Chart 2: Tons of Ash Produced per Ton of Waste Processed

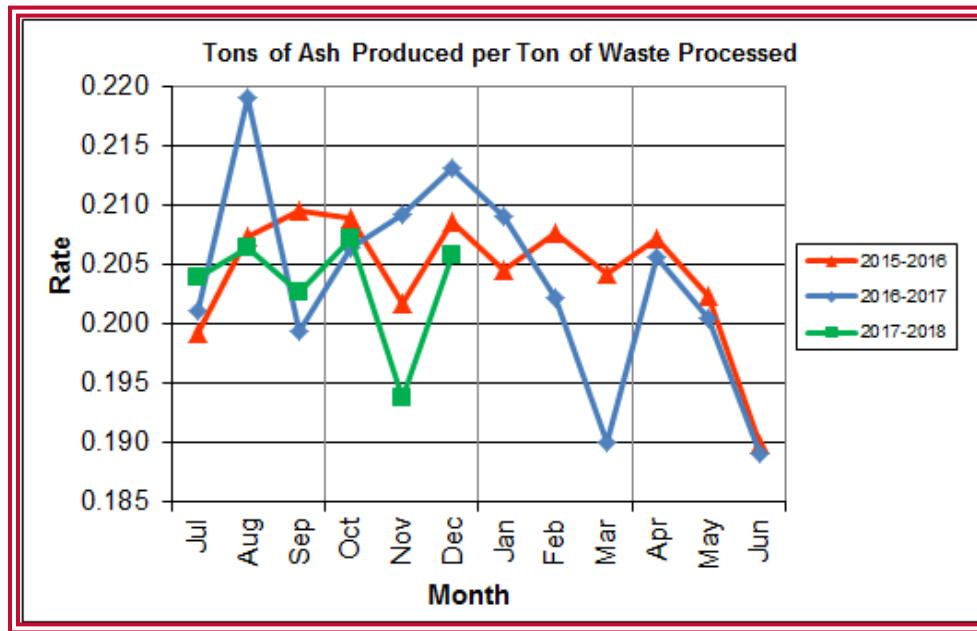


Chart 2 illustrates that the average ash production rate in Q2FY18 was slightly lower (0.7%) at 20.3% of processed waste, compared to the corresponding quarter in FY17 when the rate was 21.0%. Ash production rates remain significantly lower than comparable facilities, mainly due to less water in the ash stream, coupled with good metal removal.

Chart 3: Ferrous Recovery Rate

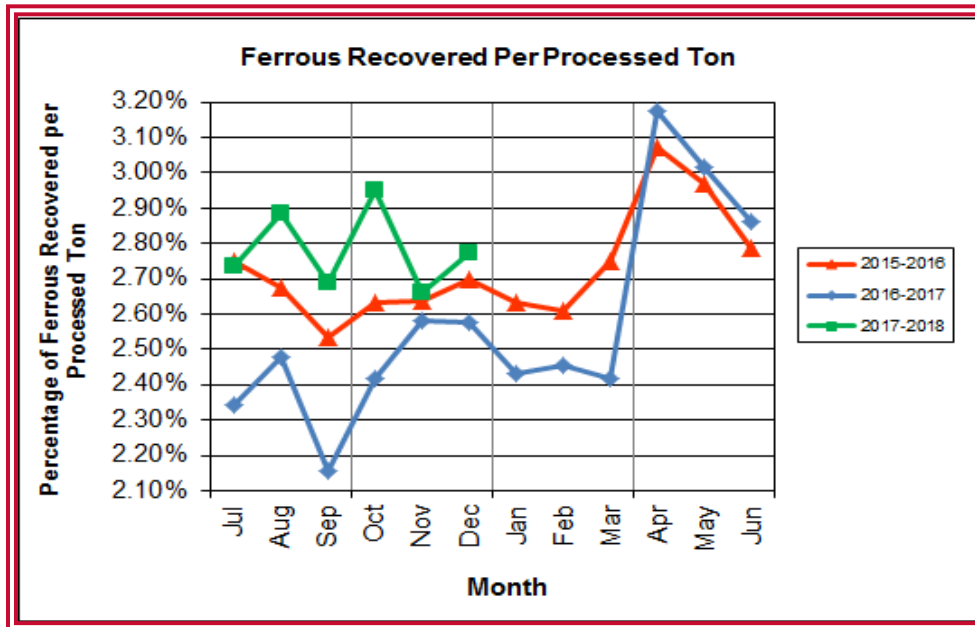
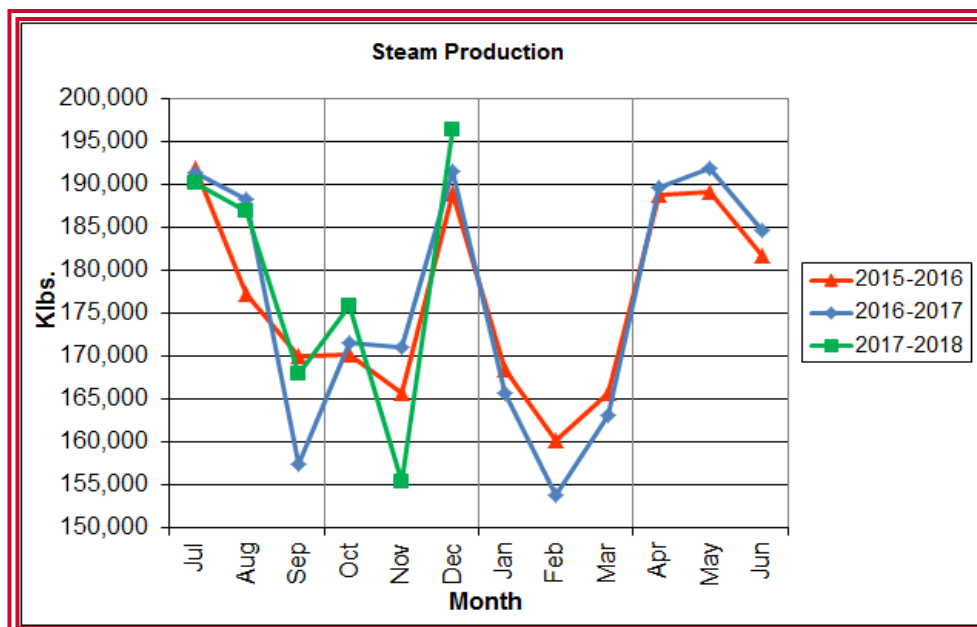


Chart 3 depicts the monthly ferrous metal recovery rate as a percentage of processed MSW tonnage. In Q2FY18, 2,394 tons of ferrous metals were recovered, which is 10.7% higher than the corresponding quarter in FY17 and equivalent to 2.8% of processed waste. CAAI indicated that it replaced the last 8 inches of the main vibrating ash pan at the magnet during Q4FY17, which positively impacted the ferrous recovery.

Chart 4: Steam Production



In Chart 4, the total steam production for Q2FY18 was 527,754 klbs., and lower (1.2%) than the corresponding quarter in FY17. The decrease in steam generation is attributable to the decrease (1.8%) in waste heating value, paired with more boiler downtime (242 additional hours).

Chart 5: 12-Month Rolling Steam Production

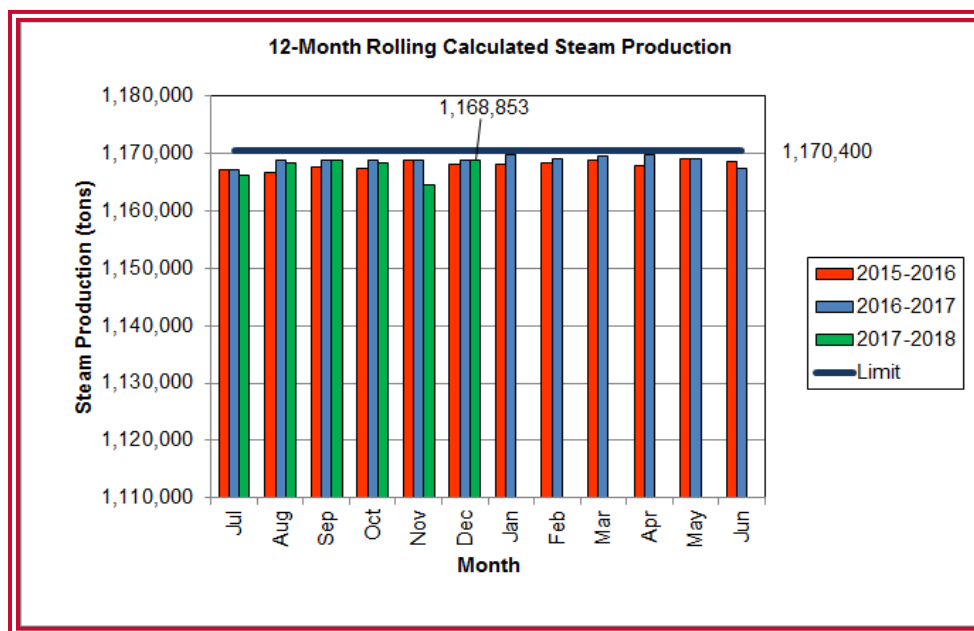
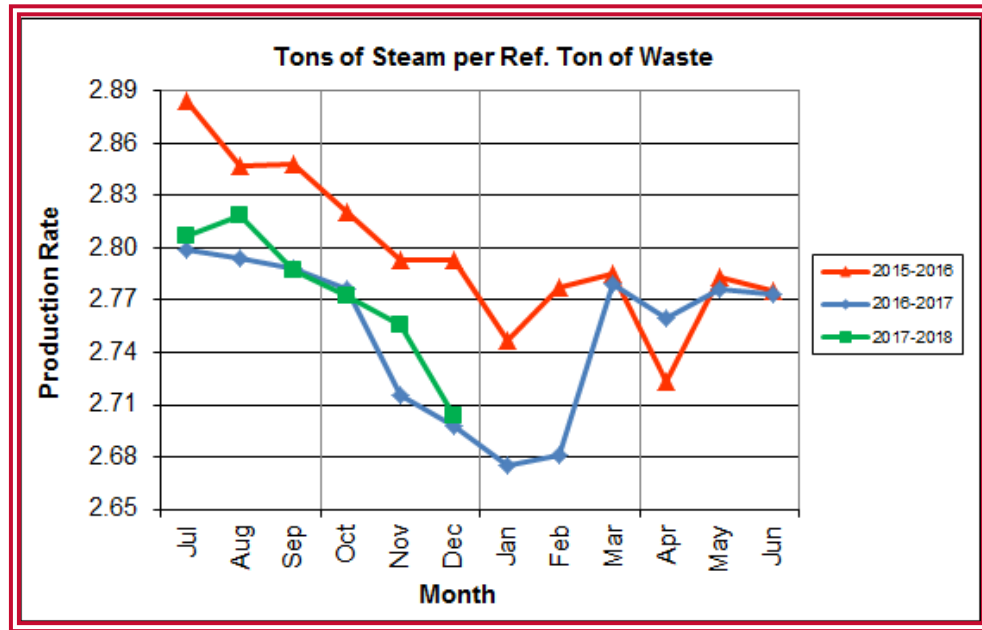


Chart 5 depicts the 12-month rolling steam production total for the period ending in December 2017. According to the Title V permit, the annual steam production for the Facility shall not exceed 1,170,400 tons on the basis of an average value of 3.34 lbs of steam per lb of MSW processed, calculated monthly as the sum of each consecutive 12 month period. The Facility was in compliance with the 12-month rolling steam production total every month in Q2FY18. The 12-month rolling total for steam production ending in September 2017 was 1,168,853 tons which is 99.9% of the limit. Chart 5 clearly shows that Facility throughput, and in turn, steam and electricity production are being throttled to stay ever so slightly below the steam production limit nearly every month.

Chart 6: Steam Production Rate



In Chart 6, the conversion of raw waste tonnages into “reference tons” is another way of analyzing steam production, and helps to determine whether changes are related to boiler performance or to fuel issues. “Reference tons” are adjusted to account for the calculated average fuel heating value, so that lower Btu fuel raw tonnages are adjusted upwards and vice versa. In Q2FY18, this metric tracked slightly higher (0.5%) at 2.74 tons_{steam/ton_{ref.}}, compared to the corresponding quarter in FY17. This trend shows a slight improvement of boiler performance compared to the corresponding quarter in FY17, but is lower (2.1%) than two (2) years ago.

Chart 7: Calculated Waste Heating Value

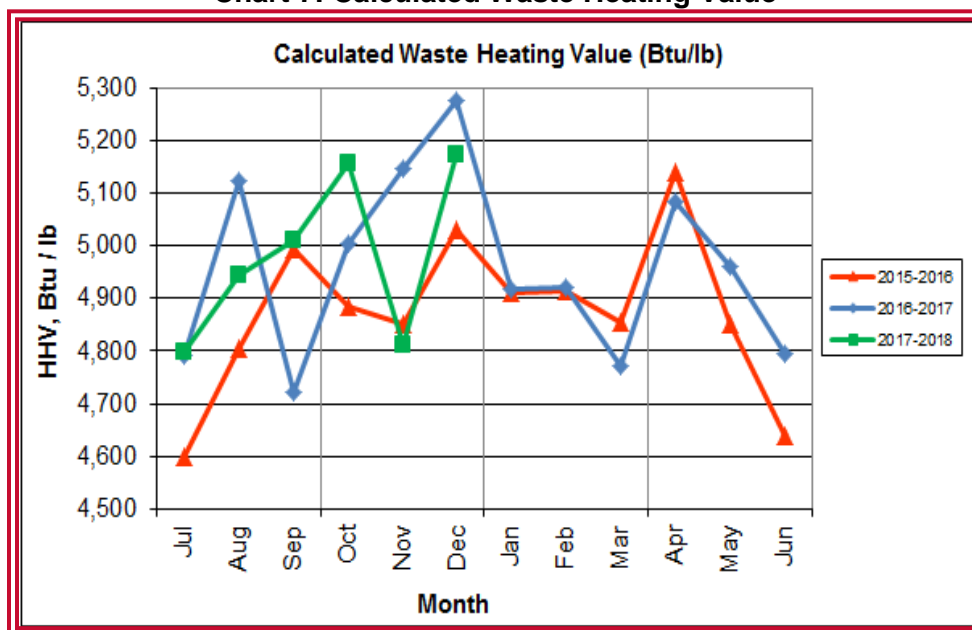


Chart 7 illustrates that Q2FY18 calculated average waste heating value was lower (1.8%) at 5,048 Btu/lb than the corresponding quarter Q2FY17, which averaged 5,142 Btu/lb.

Table 2: Quarterly Performance Summaries

Month		Waste Processed (tons)	Waste Diverted (tons)	Ash Shipped (tons)	Special Handling (Supplemental) (tons)	Ferrous Recovered (tons)	Steam Produced (klbs)	Net Electrical Generation (MWhr)
Q2FY16	Quarterly Totals	85,572	0	17,669	2,147	2,274	524,844	36,665
	October -15	27,796	0	5,807	684	732	170,190	11,899
	November -15	27,510	0	5,549	676	726	165,681	11,626
	December - 15	30,266	0	6,313	787	816	188,973	13,140
Q2FY17	Quarterly Totals	85,603	0	17,953	2,902	2,163	534,113	38,588
	October -16	27,778	0	5,734	926	671	171,525	12,140
	November -16	27,525	0	5,762	941	711	170,976	12,229
	December - 16	30,300	0	6,457	1,035	781	191,612	14,219
Q2FY18	Quarterly Totals	85,642	0	17,350	4,531	2,394	527,754	37,800
	October -17	27,689	0	5,739	1,638	817	175,965	12,417
	November -17	26,359	0	5,107	1,554	701	155,341	10,777
	December - 17	31,594	0	6,504	1,339	876	196,448	14,606
FY18 YTD Totals		174,665	0	35,547	9,979	4,862	1,072,836	75,838
FY17 Totals		349,516	0	71,208	13,411	9,036	2,120,115	150,935
FY16 Totals		349,881	0	71,019	5,413	9,864	2,109,442	145,085

Table 2 presents the production data provided to HDR by CAAI for Q2FY18 on both a monthly and quarterly basis. For purposes of comparison, data for

Q2FY16 and Q2FY17 are also shown, as well as FY16, FY17 and FY18 Year-to-Date (YTD) totals.

In comparing quarterly totals, the data shows:

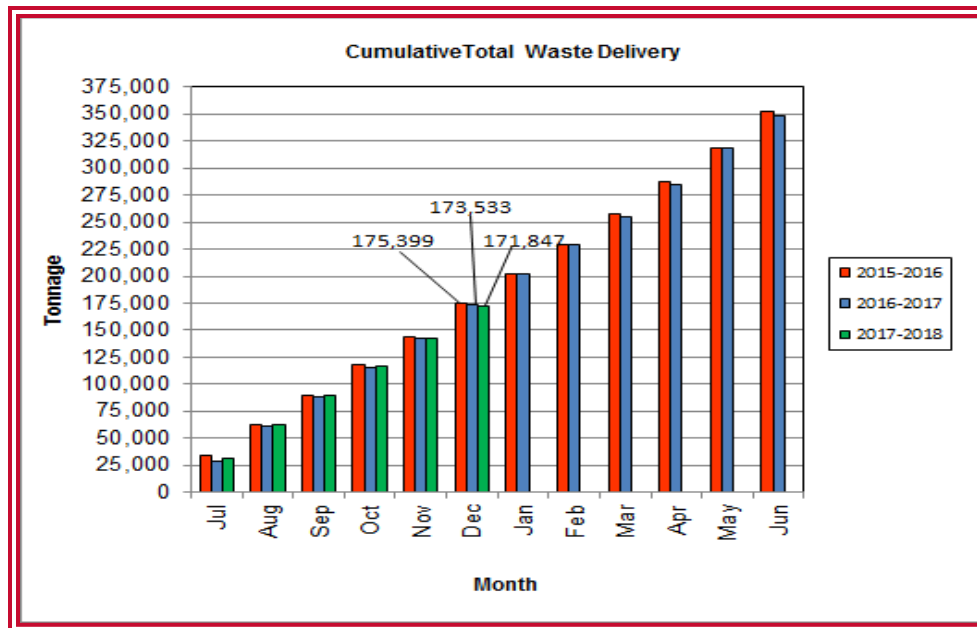
- Slightly more waste was processed in Q2FY18 than Q2FY17 and Q2FY16, but the quarterly totals are within one tenth of one percent (<0.1%) of each other
- Less steam was generated in Q2FY18 than Q2FY17, and more than Q2FY16
- Less electricity was generated in Q2FY18 than Q2FY17, and more than Q2FY16
- Significantly more supplemental waste was received in Q2FY18 than Q2FY17 and Q2FY16.

Please note that the total steam generation figures presented in Table 2 do not correlate with the annual steam production limit from the Facility Permit; such limits apply on a rolling average monthly basis, and not a fiscal year basis. It is also worth noting that the quantity of waste processed during Q2FY18 continues to be limited by the steam production permit restrictions (refer to Chart 5).

Table 3: Waste Delivery Classification

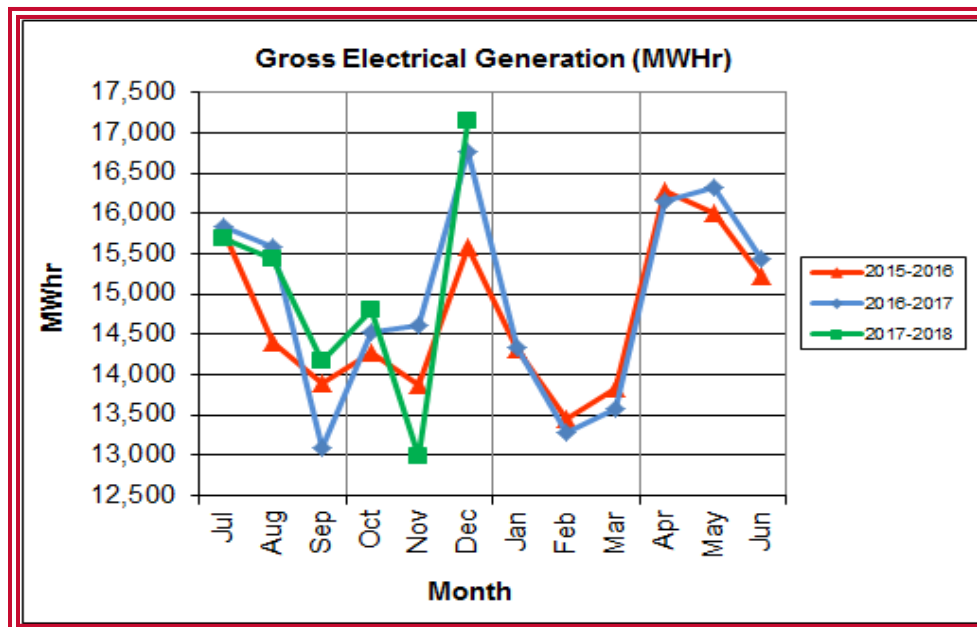
		<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Totals</u>	<u>% of Total</u>
FY14	City Waste	2,065	1,693	1,702	1,924	1,566	1,780	1,529	1,231	1,556	2,256	2,203	1,883	21,389	6.11%
	County Waste	3,459	3,079	2,784	3,091	2,707	2,802	2,568	1,957	2,272	3,326	3,987	3,387	35,419	10.12%
	Municipal Solid Waste	26,167	23,604	22,034	23,354	21,879	25,531	23,869	22,523	23,198	25,414	27,206	24,812	289,590	82.75%
	Supplemental Waste	546	676	248	410	188	268	275	192	231	253	151	110	3,548	1.01%
	MSW Totals	32,237	29,053	26,768	28,779	26,340	30,380	28,241	25,903	27,256	31,249	33,546	30,193	349,946	100.00%
		<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Totals</u>	<u>% of Total</u>
FY15	City Waste	1,814	1,497	1,699	1,737	1,518	1,770	1,411	1,209	1,648	2,155	2,059	2,045	20,562	5.91%
	County Waste	3,297	2,868	2,973	3,095	2,508	2,852	2,358	1,833	2,411	3,269	3,652	3,572	34,687	9.96%
	Municipal Solid Waste	26,661	24,466	21,887	21,241	21,678	27,906	24,611	20,915	24,094	25,189	23,126	25,667	287,442	82.57%
	Supplemental Waste	141	275	329	521	764	529	389	351	272	613	531	698	5,413	1.55%
	MSW Totals	31,913	29,106	26,888	26,595	26,468	33,057	28,769	24,308	28,424	31,225	29,369	31,982	348,105	100.00%
		<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Totals</u>	<u>% of Total</u>
FY16	City Waste	1,960	1,563	1,723	1,645	1,685	1,872	1,147	1,619	1,811	2,024	1,950	2,220	21,219	6.03%
	County Waste	3,627	2,880	2,832	2,869	2,682	2,891	2,025	2,389	2,694	2,406	2,508	2,661	32,465	9.22%
	Municipal Solid Waste	27,933	22,999	22,552	22,850	20,679	26,138	22,632	22,781	22,935	24,388	26,561	27,355	289,801	82.32%
	Supplemental Waste	676	427	771	684	676	787	642	850	792	996	605	661	8,565	2.43%
	MSW Totals	34,196	27,869	27,878	28,047	25,722	31,687	26,446	27,639	28,232	29,814	31,623	32,896	352,049	100.00%
		<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Totals</u>	<u>% of Total</u>
FY17	City Waste	1,678	1,836	1,668	1,722	1,817	1,708	1,597	1,452	1,604	1,882	2,170	2,002	21,136	6.06%
	County Waste	2,386	2,469	2,370	2,184	2,321	2,289	2,287	2,016	2,517	2,371	2,877	2,889	28,976	8.31%
	Municipal Solid Waste	24,862	26,976	22,760	22,110	21,598	25,996	24,218	20,888	20,401	25,004	26,143	24,135	285,091	81.78%
	Supplemental Waste	504	642	734	926	941	1,036	1,083	1,413	1,291	1,420	1,705	1,717	13,412	3.85%
	MSW Totals	29,430	31,922	27,532	26,941	26,677	31,030	29,185	25,769	25,814	30,677	32,895	30,743	348,615	100.00%
		<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Totals (YTD)</u>	<u>% of Total (YTD)</u>
FY18	City Waste	1,699	1,876	1,642	1,719	1,849	1,541							10,326	6.01%
	County Waste	2,458	2,654	2,513	2,529	2,635	2,321							15,110	8.79%
	Municipal Solid Waste	24,950	25,303	21,518	20,885	19,108	24,668							136,432	79.39%
	Supplemental Waste	1,807	1,835	1,805	1,638	1,553	1,339							9,978	5.81%
	MSW Totals	30,914	31,668	27,478	26,772	25,146	29,869	0	0	0	0	0	0	171,847	100.00%

Chart 8: Cumulative Total Waste Delivery



As depicted in Table 3 and Chart 8, for the quarter ending in December 2017; cumulative total waste delivery was 1.0% lower compared to the same period in FY17.

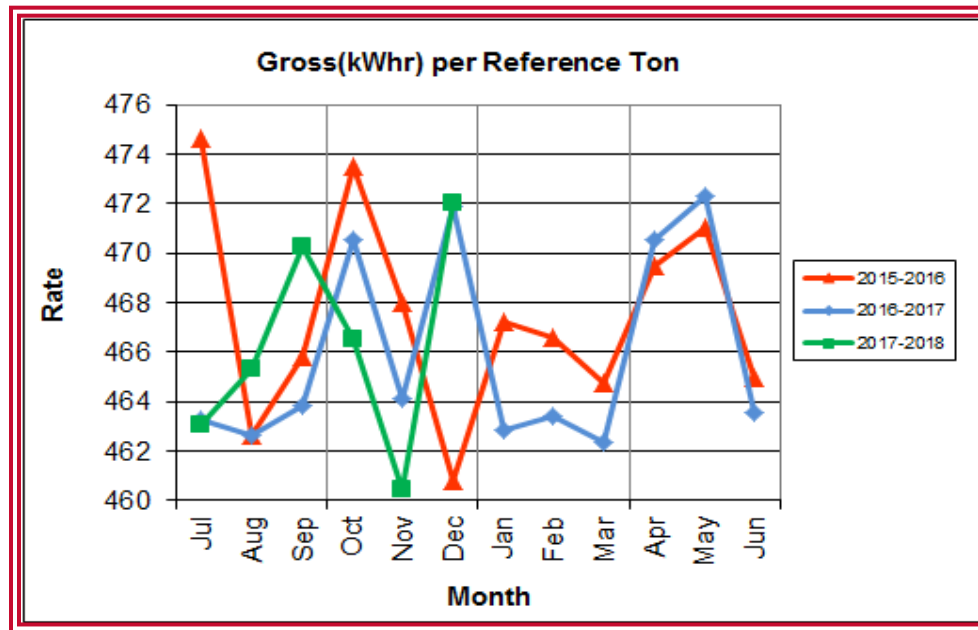
Chart 9: Gross Electrical Generation



During Q2FY18, the Facility generated 44,928 MWhrs (gross) of electricity compared to Q2FY17 generation of 45,907 MWhrs (gross), a 2.1% decrease.

The decrease in electricity generated (gross) in Q2FY18, is attributable to lower steam production.

Chart 10: Gross Conversion Rate



As shown in Chart 10, the average gross electrical generation per reference ton of refuse processed during Q2FY18 was 466 kWhr, which is slightly lower (0.5%) than the corresponding quarter in FY17. Since this calculated value uses reference or normalized tonnages of waste, it should cancel the effect of MSW heating value (Btu content) variability.

Chart 11: Net Conversion Rate

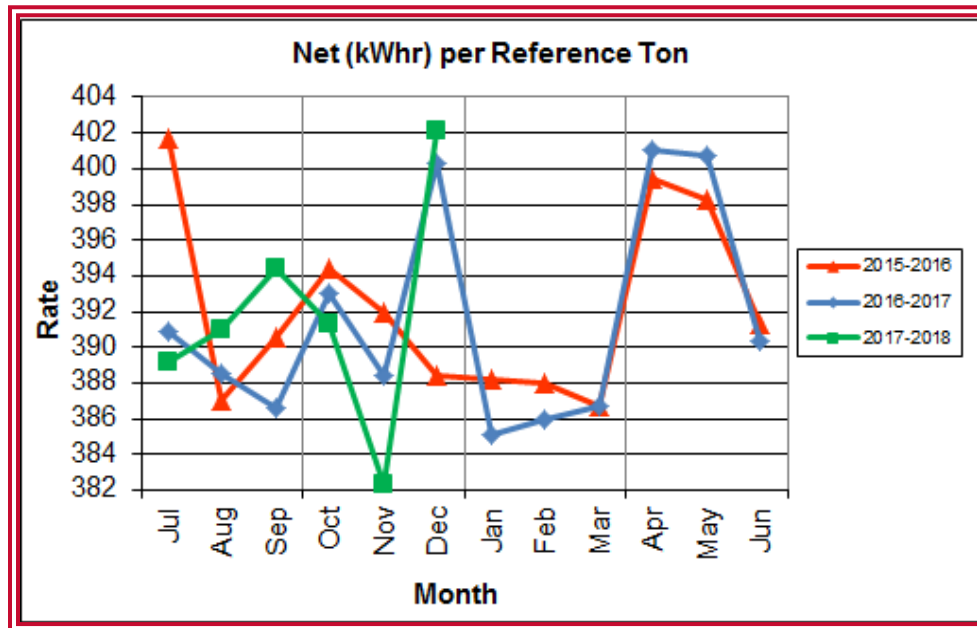


Chart 11 depicts the normalized net power (gross minus in-house usage) generation history. In Q2FY18, the average net electrical generation per reference ton was 392 kWhr, which is 0.5% lower than the corresponding quarter in FY17.

Chart 12: Net Conversion Rate

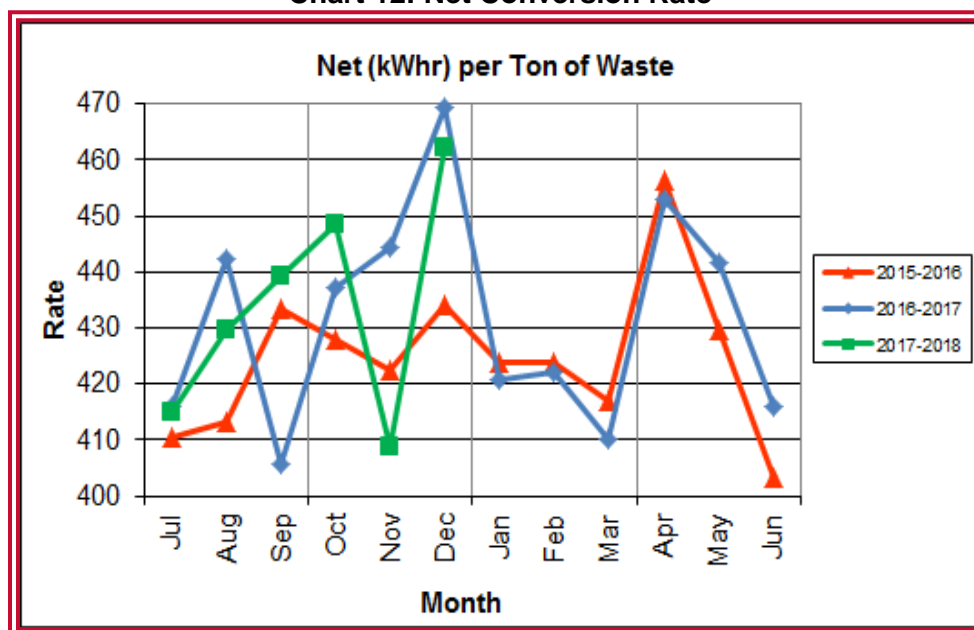
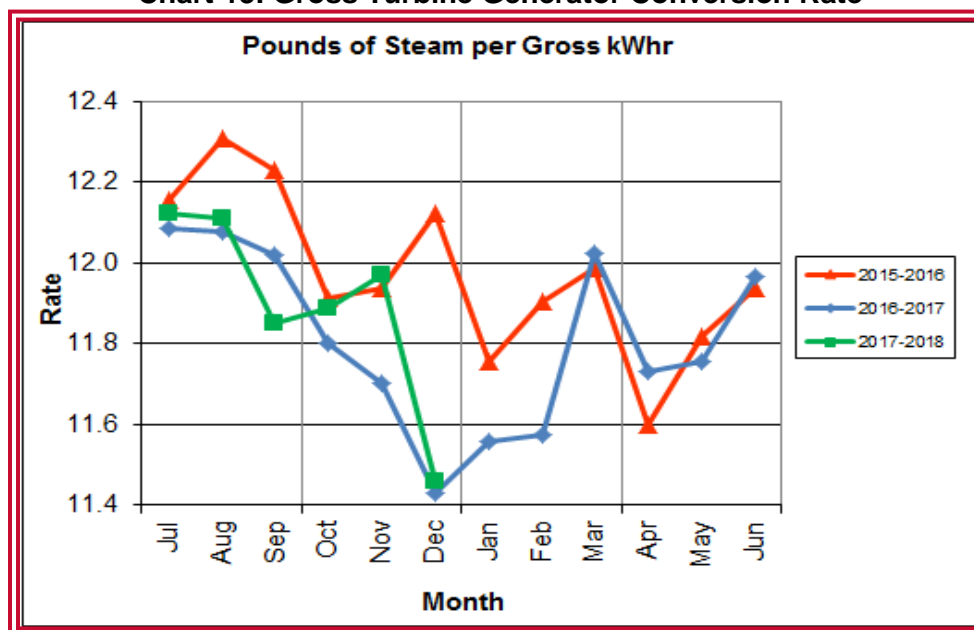


Chart 12 depicts the net power generation per processed ton. The net electrical generation per processed ton in Q2FY18 was 440 kWhr, which is 2.3% lower than the corresponding quarter in FY17, and is attributable to lower steam production and lower average waste HHV during the quarter.

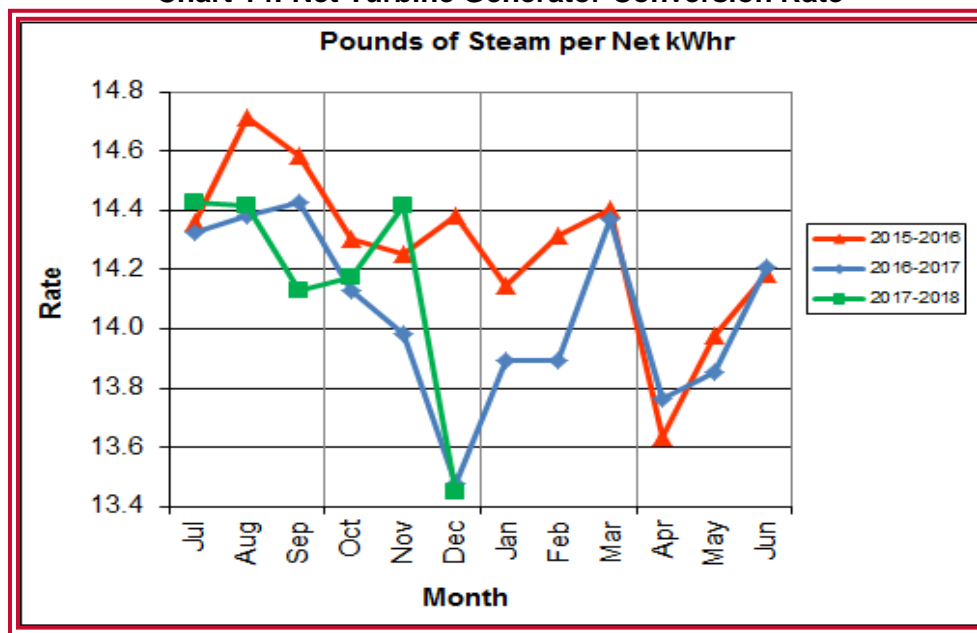
Chart 13: Gross Turbine Generator Conversion Rate



Charts 13 and 14 illustrate the quantities of steam required to generate one (1) kWhr of electricity, gross and net respectively. This measure is a turbine

generator performance indicator, where lower steam rates indicate superior performance. For simplification, this calculated rate is based on the average for the two turbine generators. In Q2FY18 the average lbs of steam consumed per gross kWhr generated was 11.8, which is 1.0% higher (less efficient) than the corresponding quarter Q2FY17. A factor that negatively impacts this metric is Turbine Generator No. 2, which continues to operate with its Stage 9 blades removed from the rotor. CAAI reported that during the Turbine Generator No. 2 overhaul in November 2013, some cracking was observed on the Stage 9 blades of the rotor, and the blading in that row was removed as a precautionary measure. CAAI originally indicated that a new set of blades would be manufactured and installed during a Turbine Generator No. 2 Outage in 2016, but advised in May 2015, that the implementation of the replacement blades installation would be delayed, and did not provide a date for repair. The average lbs of steam consumed per net kWhr was 14.0, which is 0.9% higher (less efficient) than the corresponding quarter in FY17. The average main steam temperature during the quarter was 688.0° F, which is 0.3% lower than the average main steam temperature of the corresponding quarter last fiscal year and 12.0° F lower than design temperature of 700° F.

Chart 14: Net Turbine Generator Conversion Rate



4.1 Utility and Reagent Consumptions

Table 4: Facility Utility and Reagent Consumptions

Utility	Units	Q2FY18 Total	Q2FY17 Total	Q2FY18"Per Processed Ton" Consumption	Q2FY17"Per Processed Ton" Consumption	FY18 YTD Total	FY17 Total
Purchased Power	MW/hr	5,555	5,712	0.06	0.07	11,225	22,906
Fuel Oil	Gal.	16,640	10,630	0.19	0.12	30,880	58,890
Boiler Make-up	Gal.	1,340,000	1,740,000	15.65	20.33	2,702,000	6,257,000
Cooling Tower Make-up	Gal.	31,624,142	36,611,403	369.26	427.69	71,993,018	152,993,251
Pebble Lime	Lbs.	1,414,000	1,290,000	16.51	15.07	2,818,000	5,042,000
Ammonia	Lbs.	190,000	180,000	2.22	2.10	369,000	710,000
Carbon	Lbs.	92,000	94,000	1.07	1.10	182,000	374,000
Dolomitic Lime	Lbs.	168,000	170,000	1.96	1.99	420,000	784,000

Fuel oil usage during the quarter represents approximately 0.30% of the total heat input to the boilers, which compares favorably with industry averages, and somewhat higher than the percentage of heat input in Q2FY17 which was 0.19%. Fuel oil is used to stabilize combustion of wet fuel, as well as during start-up and shut-down of the boilers for maintenance. Boiler makeup water usage during the quarter represents 2.1% of steam flow, which is slightly lower than the boiler makeup in Q2FY17 which was 2.7%, and is acceptable. Pebble lime usage, at 1,414,000 lbs. is higher (9.6%) than the corresponding quarter last year, and the quarterly consumption rate of 16.5 lbs/ton is comparable to historical levels (16-18 lbs/ton).

In comparing Q2FY18 to Q2FY17 on a per processed ton consumption basis:

- the purchased power consumption rate was 2.8% lower
- the total fuel oil consumption rate was 56.5% higher
- the boiler make-up water consumption rate was 23.0% lower
- the cooling tower make-up water consumption rate was 13.7% lower
- the total pebble lime consumption rate was 9.6% higher
- the ammonia consumption rate was 5.5% higher
- the carbon consumption rate was 2.1% lower
- the total dolomitic lime consumption rate was 1.2% lower

CAAI reports that the increase in pebble lime usage and consumption during the quarter is attributable to controlling SO₂ spikes that occurred during the combustion of waste. The significant increase in fuel oil consumption during the quarter is attributable to usage to stabilize combustion of wet fuel, as well as during start-up and shut-down of the boilers for maintenance.

4.2 Safety & Environmental Training

The Facility experienced one (1) OSHA recordable accident during the quarter and prior to the incident had operated 420 days without an OSHA recordable accident. CAAI reports that on November 13, 2017, a maintenance helper suffered a fingertip amputation (without bone loss) on the middle finger of his hand when his finger got caught in a door closer as he was pushing a mop bucket through a doorway. The incident was reported, as required, to Virginia OSHA on November 14, 2017 due to the injury resulting in an amputation. OSHA requested the Facility perform an internal investigation into the matter and post a letter notifying employees of the incident. The investigation was completed and closed in November.

During the quarter, Safety and Environmental training was conducted with themes as follows:

October 2017

- Safety:
 - Hazardous Communication
 - Globally Harmonized System
 - Corrosives/Flammables
 - Compressed Gas Cylinders
- Environmental:
 - Spill Prevention Control and Countermeasure (SPCC) Plan
 - Accidental Spill and Sludge Control Plan

November 2017

- Safety:
 - Corporate Electrical Safety Procedures

- Electrical Safety and Body Positioning
- Energized Equipment Work Plans
- Review of Potential Electrical Emergencies
- Environmental:
 - Metal Recovery and Analysis

December 2017

- Safety:
 - Housekeeping
 - Emergency Exits and Walkways
 - Pre-job Planning
 - Scaffolding Use & Inspection
- Environmental:
 - Universal Waste and Environmental Compliance

5.0 Facility Maintenance

Throughout the quarter, significant routine and preventative maintenance was performed. HDR considers that the Facility is implementing an effective maintenance regimen, and is performing routine and preventative maintenance, along with selected equipment replacements in a timely manner. CAAI monthly maintenance reports provide a detailed account of maintenance performed.

Beginning October 7, 2017 Boiler No. 3 experienced 121.5 hours of downtime for scheduled maintenance. Some significant maintenance items completed during the outage are as follows:

- Change-out of the Induced Draft Fan inlet box, fan shaft and wheel, damper, inboard and outboard bearings, housings, and seals
- Replacement of five (5) curved blocks on the grate
- Repair of the front drop-off wall on Run 1 side
- Replacement of the feed table bars position Nos.1 through 15
- Replacement of the front Over Fire Air Fan nozzle joint
- Change-out of four (4) soot blower elements: G9B Nos. 3, 4, 5, and 11.
- Re-plating of the transverse wall on the ash discharger

- Installation of new isolation valves on the hydraulic skid
- Change-out of the Run No. 2 side Feed Ram Hydraulic Cylinder.

Beginning November 4, 2017 Boiler No. 2 experienced 120.8 hours of downtime for scheduled maintenance. Some significant maintenance items completed during the outage are as follows:

- Replacement of six (6) soot blower elements: G9B Nos. 1, 2, 3, 4, 5, and 8.
- Replacement of 18 tube shields in the superheater section and also two (2) hangers
- Replacement of the flex gasket on No. 2 Attenuator
- Replacement of the Over Fire Air Fan expansion joint
- Replacement of four (4) broken grate bars on the run No. 2 side
- Replacement of five (5) carrier beam bolts
- Change-out of entire coupling on the Over Fire Air Fan
- Change-out of both the inboard and outboard bearings, adapters, housings, coupling, and the motor on the Under Fire Air Fan
- Repair of several holes in the viewport mounting boxes on the 4th Floor
- Replacement of the angular brake plates on the feed rams, and also repair of several feed chute water jacket leaks
- Removal and Replacement of the motor on the No. 2 Induced Draft Fan, and also installation of new shaft seals
- Replacement of the complete ash discharger transition chute

In addition to the scheduled maintenance, CAAI reports that 1,073 preventative maintenance actions were completed during the quarter.

5.1 Availability

Facility availabilities for Q2FY18 are shown in Table 5. According to CAAI reports, the average unit availabilities for Boiler Nos. 1, 2, and 3 for Q2FY18 were 88.1%, 92.3%, and 93.0%, respectively. The three-boiler average

availability during the quarter was 91.1%, which is excellent and comparable to that of mature, well run waste to energy facilities. Note that the boiler availability was negatively impacted by Boiler Nos. 2 and 3 scheduled maintenance (242.0 hours total) and a Boiler No. 1 Induced Draft Fan Bearing and Shaft Failure (256.7 hours) during the quarter.

According to CAAI reports, the average unit availabilities for Turbine Generator Nos. 1 and 2 for Q2FY18 was 100.0% during Q2FY18. Note that standby time (46.6 hours) was not factored into overall availability.

Table 5: Quarterly Facility Unit Availabilities

Availability	Q1FY18 Average	Q2FY18 Average	FY18 YTD Average
Boiler No. 1	93.5%	88.1%	90.8%
Boiler No. 2	99.2%	92.3%	95.7%
Boiler No. 3	98.2%	93.0%	95.6%
Avg.	96.9%	91.1%	94.0%
Turbine No. 1	100.0%	100.0%	100.0%
Turbine No. 2	96.1%	100.0%	98.1%
Avg.	98.1%	100.0%	99.0%

5.2 Downtime Summary

Table 6: Boiler Downtime – Q2FY18

Boiler Number	Outage Begin Date	Outage End Date	Hours Unavailable	Downtime Classification	Reason Unavailable
3	10/7/18	10/12/17	121.5	Scheduled	Fall 2017 Scheduled Maintenance
2	10/11/17	10/12/17	16.5	Unscheduled	Grate Bar Failure – Stoker System
2	10/25/17	10/25/17	13.0	Unscheduled	Induced Draft Fan Bearing Failure
2	10/30/17	10/30/17	1.4	Unscheduled	External Cause
2	11/4/17	11/9/17	120.8	Scheduled	Fall 2017 Scheduled Maintenance
3	11/7/17	11/8/17	15.7	Unscheduled	Waterwall Failure – External Leak
3	11/9/17	11/9/17	7.0	Standby	Reason Unspecified
1	11/11/17	11/22/17	256.7	Unscheduled	Induced Draft Fan Bearing and Shaft Failure
2	12/15/17	12/15/17	13.5	Unscheduled	Elevated vibration readings on the Induced Draft Fan
3	12/15/17	12/16/17	18.9	Unscheduled	Economizer Tube Leak Repair
2	12/27/17	12/27/17	5.5	Unscheduled	Hydraulic Hose Repair on Stoker System
Total Unscheduled Downtime			338.2 Hours		
Total Scheduled Downtime			242.3 Hours		
Total Standby Downtime			7.0 Hours		
Total Downtime			587.5 Hours		

Table 7: Turbine Generator Downtime – Q2FY18

Turbine Generator Number	Outage Begin Date	Outage End Date	Hours Unavailable	Downtime Classification	Reason Unavailable
2	11/7/17	11/9/17	46.6	Standby	Boiler Nos. 2 and 3 down simultaneously
Total Unscheduled Downtime			0.0 Hours		
Total Scheduled Downtime			0.0 Hours		
Total Standby Downtime			46.6 Hours		
Total Downtime			46.6 Hours		

5.3 Facility Housekeeping

CAAI is performing Facility housekeeping and maintaining plant cleanliness in accordance with acceptable industry practices. A site inspection was conducted in November 2017. At the time of the inspection, new deficiencies were recorded and prior deficiencies were given a status update. Photos of interest from the inspection are depicted in Appendix B. The Facility housekeeping ratings from the November 2017 inspection are presented in Table 8.

Table 8: Facility Housekeeping Ratings – November 2017

Facility Area	Acceptable	Needs Improvement	Unacceptable
Tipping Floor	√		
Citizen's Drop-off Area	√		
Tipping Floor Truck Exit	√		
Front Parking Lot	√		
Rear Parking Lot	√		
Boiler House Pump Room	√		
Lime Slurry Pump Room	√		
Switchgear Area	√		
Ash Load-out Area	√		
Vibrating Conveyor Area	√		
Ash Discharger Area	√		
Cooling Tower Area	√		
Truck Scale Area	√		
SDA/FF Conveyor Area	√		
SDA Penthouses	√		
Lime Preparation Area	√		
Boiler Drum Levels	√		
Turbine Room	√		
Electrical Room	√		

6.0 Environmental

The air pollution control equipment maintained emission concentrations well within the established regulations. Average Continuous Emission Monitoring System (CEMS) data collected for each monthly period during Q2FY18 are summarized in Appendix A. The Facility experienced one (1) permit deviation during Q2FY18. A summary of the permit deviation is shown on Table 9. Note that prior to the permit deviation, the CAAI Facility operated 1,405 days without a reportable excursion to VADEQ.

The Facility experienced a non-exempt permit deviation on October 17, when the Boiler No. 3 Carbon Monoxide (CO) 4-hour level reached 118 ppm (100 ppm limit). The following description of the event is what was reported to VADEQ by CAAI:

On October 17, 2017 at approximately 19:13 changes in boiler operating parameters indicated to the Control Room Operator (CRO) that high BTU waste had been fed, although CO remained low. At approximately 19:39, Boiler No. 3 steam flow spiked high and economizer O₂ dropped appreciably. As a result of the excess air being consumed, CO rose to approximately 2,000 ppmc where it remained for three (3) minutes. Following the CRO's corrective actions CO was lowered to 82 ppmc. At 19:38, steam flow dropped below set point which caused the grates to activate and reignite the high BTU MSW that was still on the grates in Boiler No. 3, which led to a second steam spike to approximately 2,000 ppmc where it remained for another four (4) minutes. The final hourly average in the 4-hour block was 405 ppmc which resulted in the deviation.

CAAI reported that in order to prevent a future similar excess emissions event, all CRO's and Shift Supervisors have been trained on proper management of high BTU material, including immediately instructing the Crane Operator to cease feeding the material, reduce under fire air, increase over fire air, lighting the

burner if possible and identifying how to prevent the grates from activating and reigniting the remaining material in the combustion chamber.

Table 9: Quarterly Permit Deviations

Number	Date	Excursion	Exempt
3	10/17/17	Boiler No. 3 4-hour CO levels reached 118 ppm (100 ppm limit)	No

On August 8, 2014, CAAI sent a letter to the Virginia Department of Environmental Quality (VADEQ) requesting relief from the steam permit limit requirements in the Facility's Title V and PSD permits. These requested changes relate to the permit values established for the calculated steam-to-waste ratio, which has resulted in a reduction of MSW throughput. In recent discussions, CAAI indicated that it is re-evaluating options to the proposed permit changes, and will provide further updates on this issue.

6.1 Nitrogen Oxide Emissions

During Q2FY18, the monthly emission concentrations of nitrogen oxides (NO_x) averaged 160.3 ppmdv, 158.3 ppmdv and 159.3 ppmdv for Boiler Nos. 1, 2, and 3, respectively. CAAI continues to operate the units at the lower (160 ppmdv) set-points, except immediately following a scheduled outage and associated boiler cleaning.

6.2 Sulfur Dioxide Emissions

During Q2FY18 the monthly emission concentration of stack sulfur dioxide (SO₂) averaged 1.0 ppmdv, 1.3 ppmdv, and 0.3 ppmdv for Boiler Nos. 1, 2, and 3, respectively. All of these stack SO₂ concentrations are significantly below the permit limit of 29 ppmdv @ 7% O₂.

6.3 Carbon Monoxide Emissions

During Q2FY18, the average CO emission concentrations on Boiler Nos. 1, 2, and 3 were 42.7 ppmdv, 36.0 ppmdv, and 35.7 ppmdv, respectively, and all are well within permit limits (100 ppmdv, hourly average). However, as reported by

HDR during the May 2016 FMG Meeting, and continuing through Q2FY18, CO averages have been trending higher over the past year of operations on all three boilers, and CAAI has been requested to investigate and mitigate this uptrend. While not a permit issue, it is indicative of poorer boiler performance and combustion efficiency.

6.4 Opacity

During Q2FY18, the average opacity for Boiler Nos. 1, 2, and 3 was 0.8%, 1.5%, and 0.7% respectively. All of these averages are significantly below the 10% (6-minute) average permit limit.

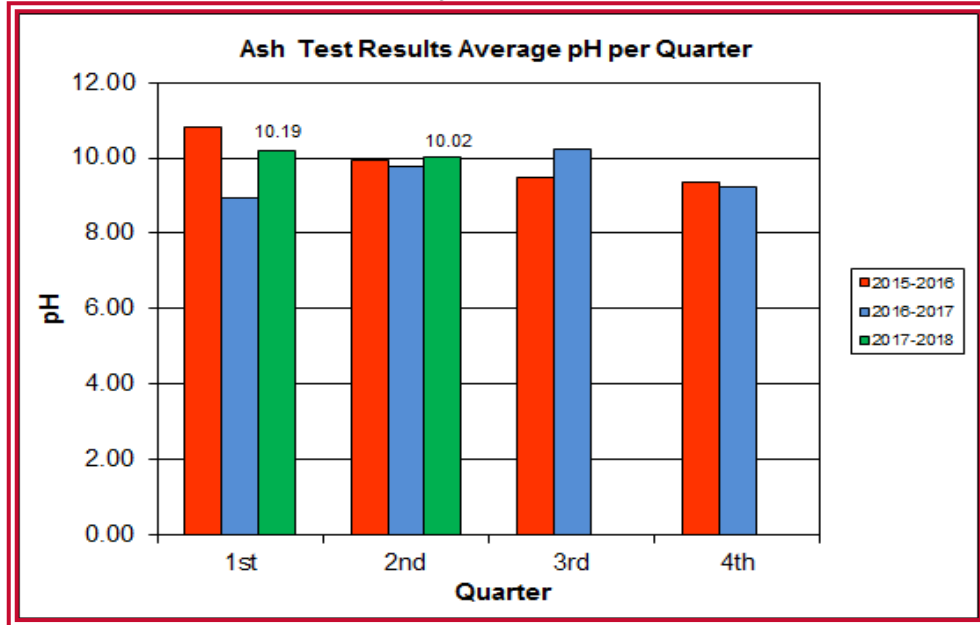
6.5 Daily Emissions Data

Appendix A, Tables 10, 11, and 12 tabulate the monthly average, maximum, and minimum emissions data for each unit during Q2FY18. Excursions, if any, would appear in bold print. It should be noted that these tabulations of monthly averages, reported here for informational purposes, are based on tabulations of daily averages. These averages do not correlate with official reports to the regulatory agencies because of differences in averaging times and other technical differences required by agency report formats.

6.6 Ash System Compliance

The dolomitic lime feed rate is adjusted periodically in order to maintain a desired ash pH level in the range of 8.0 to 11.0. Since initial startup, the feed rate has varied from between 1 to 9 lbs per ton each month. Ash Toxicity (TCLP) tests were not performed during Q2FY18. CAAI samples ash monthly in-house and documents pH reading to adjust dolomitic lime feed rate. The results for the ash pH tests are found below in Chart 15 where each quarter is represented by the average of the respective monthly readings. During Q2FY18, the average ash pH for in-house tests was 10.0.

Chart 15: Quarterly Ash Test Results



APPENDIX A FACILITY CEMS DATA

Table 10: Unit #1 Monthly Summary for Reportable Emissions Data

Group#-Channel#		G8-C35	G8-C28	G8-C8	G8-C4	G8-C12	G8-C34	G8-C37	G8-C40	G8-C39
Long Descrip.		U-1 Steam	U-1 Econ	U-1 Stack	U-1 Stack	U-1 Stack	U-1 Opaci	U-1 FF In	U-1 Carbo	U-1 Lime
Short Descrip.		SteamFI	SO ₂ ec	SO ₂ sc	COsc	NO _x sc	Opacity	FF InTemp	Carblnj	LimeFlow
Units		K#/Hr	ppmc	ppm	ppmc	ppmc	%	deg F	#/hr	gpm
Range		0-100	0-2000	0-500	0-4000	0-1000	0-100	100-500	0-50	0-20
Oct - 17	AVG	83.7	41.0	1.0	43.0	159.0	0.3	300.0	15.0	3.1
	Max	89.1	58.0	4.0	54.0	161.0	0.6	302.0	15.5	3.3
	Min	78.7	27.0	0.0	32.0	157.0	0.1	298.0	15.0	2.9
Nov - 17	AVG	85.6	33.0	1.0	42.0	162.0	0.6	300.0	15.1	3.1
	Max	90.1	45.0	2.0	52.0	166.0	1.2	300.0	15.1	3.2
	Min	79.5	21.0	0.0	32.0	158.0	0.3	298.0	15.0	2.8
Dec - 17	AVG	88.7	25.0	1.0	43.0	160.0	1.4	200.0	15.1	3.1
	Max	91.0	37.0	6.0	55.0	163.0	2.1	301.0	15.2	3.5
	Min	87.2	16.0	0.0	35.0	157.0	0.9	300.0	15.0	2.7
Quarter Average		86.0	0.0	1.0	42.7	160.3	0.8	266.7	15.1	3.1
Quarter Max Value		91.0	58.0	6.0	55.0	166.0	2.1	302.0	15.5	3.5
Quarter Min Value		78.7	16.0	0.0	32.0	157.0	0.1	298.0	15.0	2.7
Limits:		98	NA	29	100	205	10	331	14(a)	

(a) Carbon flow limit is a minimum value

* Note: The data reported herein represent 24 hour average data for all parameters. Emissions excursions that are measured on shorter time intervals (i.e., 4-hour block averages for CO) do not correlate with the 24 hour average data reported above.

Table 11: Unit #2 Monthly Summary for Reportable Emissions Data

Group#-Channel#		G8-C35	G8-C28	G8-C8	G8-C4	G8-C12	G8-C34	G8-C37	G8-C40	G8-C39
Long Descrip.		U-2 Steam	U-2 Econ	U-2 Stack	U-2 Stack	U-2 Stack	U-2 Opaci	U-2 FF In	U-2 Carbo	U-2 Lime
Short Descrip.		SteamFI	SO ₂ ec	SO ₂ sc	COsc	NO _x sc	Opacity	FF InTemp	CarbInj	LimeFlow
Units		K#/Hr	ppmc	ppm	ppmc	ppmc	%	deg F	#/hr	gpm
Range		0-100	0-2000	0-500	0-4000	0-1000	0-100	100-500	0-50	0-20
Oct - 17	AVG	85.7	28.0	1.0	36.0	159.0	1.6	299.0	15.1	3.0
	Max	89.7	59.0	3.0	48.0	161.0	1.8	299.0	15.3	3.2
	Min	79.1	11.0	0.0	25.0	155.0	1.3	298.0	14.9	2.4
Nov - 17	AVG	89.1	49.0	2.0	36.0	158.0	1.5	298.0	15.1	3.2
	Max	91.2	77.0	6.0	44.0	160.0	1.7	300.0	15.6	4.0
	Min	85.1	16.0	0.0	29.0	156.0	1.3	295.0	14.9	2.9
Dec - 17	AVG	89.2	35.0	1.0	36.0	158.0	1.4	298.0	15.2	3.2
	Max	90.6	50.0	7.0	45.0	160.0	1.9	299.0	15.7	4.0
	Min	85.8	27.0	0.0	23.0	154.0	0.8	297.0	15.0	2.7
Quarter Average		88.0	37.3	1.3	36.0	158.3	1.5	298.3	15.1	3.1
Quarter Max Value		91.2	77.0	7.0	48.0	161.0	1.9	300.0	15.7	4.0
Quarter Min Value		79.1	11.0	0.0	23.0	154.0	0.8	295.0	14.9	2.4
Limits:		97	NA	29	100	205	10	331	14(a)	

(a) Carbon flow limit is a minimum value

* Note: The data reported herein represent 24 hour average data for all parameters. Emissions excursions that are measured on shorter time intervals (i.e., 4-hour block averages for CO) do not correlate with the 24 hour average data reported above.

Table 12: Unit #3 Monthly Summary for Reportable Emissions Data

Group#-Channel#		G8-C35	G8-C28	G8-C8	G8-C4	G8-C12	G8-C34	G8-C37	G8-C40	G8-C39
Long Descrip.		U-3 Steam	U-3 Econ	U-3 Stack	U-3 Stack	U-3 Stack	U-3 Opaci	U-3 FF In	U-3 Carbo	U-3 Lime
Short Descrip.		SteamFI	SO ₂ ec	SO ₂ sc	COsc	NO _x sc	Opacity	FF InTemp	CarbInj	LimeFlow
Units		K#/Hr	ppmc	ppm	ppmc	ppmc	%	deg F	#/hr	gpm
Range		0-100	0-2000	0-500	0-4000	0-1000	0-100	100-500	0-50	0-20
Oct - 17	AVG	83.1	42.0	1.0	30.0	159.0	0.4	297.0	15.2	3.1
	Max	89.5	72.0	9.0	47.0	160.0	0.7	300.0	16.1	3.8
	Min	72.2	25.0	0.0	20.0	154.0	0.2	288.0	15.1	2.9
Nov - 17	AVG	87.7	35.0	0.0	38.0	160.0	0.3	298.0	15.1	3.1
	Max	91.5	56.0	2.0	47.0	162.0	1.7	298.0	15.5	3.2
	Min	73.8	16.0	0.0	28.0	159.0	0.0	295.0	15.0	2.8
Dec - 17	AVG	89.2	23.0	0.0	39.0	159.0	1.5	298.0	15.1	3.1
	Max	91.1	34.0	5.0	47.0	160.0	1.7	299.0	15.5	3.2
	Min	82.8	13.0	0.0	25.0	157.0	1.2	297.0	15.0	2.6
Quarter Average		86.7	33.3	0.3	35.7	159.3	0.7	297.7	15.1	3.1
Quarter Max Value		91.5	72.0	9.0	47.0	162.0	1.7	300.0	16.1	3.8
Quarter Min Value		72.2	13.0	0.0	20.0	154.0	0.0	288.0	15.0	2.6
Limits:		99	NA	29	100	205	10	339	14(a)	

(a) Carbon flow limit is a minimum value

* Note: The data reported herein represent 24 hour average data for all parameters. Emissions excursions that are measured on shorter time intervals (i.e., 4-hour block averages for CO) do not correlate with the 24 hour average data reported above.

APPENDIX B

SITE PHOTOS – NOVEMBER 2017



Figure 1: SDA Penthouse No. 3 Door deteriorated at base – New Deficiency



Figure 2: Drainage pipe damaged and water build up against east wall of Tipping Floor – New Deficiency



Figure 3: Old Boiler No. 2 Ash Discharger Removed



Figure 4: New Ash Discharger staged in employee parking lot to be installed during Boiler No. 2 Outage



Figure 5: New Boiler No. 2 Ash Discharger interior plating



Figure 6: Main Vibratory Conveyor – Warning Tape in place for Boiler No. 2 Ash Discharger Replacement



Figure 7: Boiler No. 2 Man Door – Scaffolding installed during outage



Figure 8: Refuse Pit – View from north to south



Figure 9: Cooling Towers, SDAs and Stack



Figure 10: Induced Draft Fan No. 3 – New Inlet Box and Rotor Installed during outage in October 2017



Figure 11: Tipping Floor – view from southeast corner



Figure 12: General Facility Photo from Tipping Floor Entrance Road



Figure 13: Metal Drop-off Roll-off



Figure 14: Citizen's Drop-off Roll-off



Figure 15: General Facility photo from in front of Fire Station on Eisenhower



Figure 16: General Facility photo from west side of Facility, up Eisenhower



Figure 17: General facility photo from parking lot entrance



Figure 18: Ferrous Recovery Drum Magnet



Figure 19: Boiler No. 2 Stoker Work in progress



Figure 20: Control Room Monitor – Boiler No. 2 and Turbine Generator No. 2 Offline



Figure 21: Ash Trailer Canopy – Doing its job in the rainy conditions



Figure 22: Boiler No. 2 Grates – Outage in Progress



Figure 23: Ash Discharger No. 2 Removed – New Discharger Installation in Progress



Figure 24: SDA Penthouse - door closed for winter months