Alexandria Arlington Resource Recovery Facility

Fiscal Year 2020

Second Quarter Operations Report

February 2020

Prepared by:

HDR Engineering, Inc.
4830 W. Kennedy Blvd., Suite 400
Tampa, Florida 33609-2548

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Definition of Abbreviations & Acronyms

Abbreviation/Acronym	Definition
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
Third	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 2020

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 2020 Fiscal Year. This report is prepared for the second quarter of the 2020 fiscal year and summarizes Facility operations between October 1, 2019 and December 31, 2019. This report identifies the fiscal year beginning on July 1, 2019 as FY20 and the quarter beginning on October 1, 2019 as Q2FY20.

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 Q2FY20. The operation of the Facility, maintenance, safety, and overall cleanliness continue to be above average. Environmental performance was good with one (1) reportable environmental excursion experienced during the quarter.

During Q2FY20, the boilers experienced one (1) instance of unscheduled downtime totaling 12.0 hours, and the turbine generators experienced three (3) instances of unscheduled downtime totaling 94.5 hours. Boiler No. 1 experienced 22.4 hours of downtime for a scheduled cleaning outage. Boiler No. 2 was offline for 372.3 hours for the Fall 2019 Scheduled Major Boiler Outage, which was longer than the typical major outage due to the installation of Covanta's Low NO_X (LN^{TM}) Technology. Turbine Generator No. 1 experienced 540.5 hours of downtime for a

scheduled Major Overhaul. The boilers experienced 39.8 hours of standby downtime and no standby time was experienced by the turbine generators. A detailed listing of downtime is provided in Section 5.2 of this report.

Average waste processed during the quarter was 933.0 tons per day, or 95.7% of nominal facility capacity. Waste deliveries averaged 927.7 tons per day, which is slightly lower (0.5%) than the burn rate.

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 was slightly higher (0.3%) compared to the corresponding quarter in FY19; steam production decreased (0.3%), and electricity generated (gross) decreased (2.7%) from the corresponding quarter in FY19. The slight decrease in steam generation is attributable to the decrease (1.8%) in waste heating value, paired with more boiler downtime (245.9 additional hours). The decrease in electricity generated (gross) in Q2FY20, is mainly due to more downtime (509.0 additional hours) experienced by the turbine generators.

3.0 Facility Inspection and Records Review

In November 2019, 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 and discussed performance issues with CAAI staff. 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 in due course, 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	Pot hole, southeast corner of Ash Trailer Canopy	August 2015	C	Repair road surface	**Status Unchanged**	Open
2	Pavement spider-cracking at Tipping Floor Entrance	November 2016	C	Resurface section of pavement at Tipping Floor Entrance	**Status Unchanged**	Open
3	SDA Penthouse No. 3 Door deteriorated at base	November 2017	C	Patch and Paint Door – Replace if necessary	**Status Unchanged**	Open
4	Roof Ventilation Fan Not Working above Deaerator	May 2019	C	Repair roof ventilation fan	**Status Unchanged**	Open
5	Diamond Plate Deck Corroded at Boiler No. 3 Opacity Monitor	May 2019	C	Sand, Prime, Paint, and Preserve	**Status Unchanged**	Open
6	Multiple stair treads missing and not adhered to Cooling Tower Access Stairs	May 2019	A	Replace missing stair tread and apply adhesive to loose stair tread	**Complete**	Closed
7	Hand Railing Posts (Typical of Most) on the Cooling Tower Deck Split with bolt exposed	May 2019	A	Replace or install caps on all posts. Consider annual application of protective coatings to increase longevity.	**During the August 2019 site visit, HDR observed that some copper caps had been installed without adhesive or mechanical fasteners on some of the posts.**	Open
8	Ferrous Metal Roll-off Containers (typical of 2) Deteriorated	August 2019	C	Patch and conduct painting preservation or replace roll-off containers.	**Complete**	Closed
9	Deterioration behind lime slurry piping in SDA Penthouse No. 2	August 2019	C	Replace kick-plate and conduct painting preservation measures	**Status Unchanged**	Open
10	Siding deteriorated beneath Baghouse No. 3 Hoppers	August 2019	C	Replace siding	**Status Unchanged**	Open
11	Windows missing/damaged on Tipping Floor — See Figure 1 (Appendix B)	November 2019	C	Replace windows	**Status Unchanged**	Open

4.0 Facility Performance

Monthly operating data provided by CAAI indicates that 85,836 tons of MSW were processed during Q2FY20, and a total of 85,352 tons of MSW including 3,824 tons of Special Handling Waste (4.5% by weight) were received. Total ash production during the quarter was 16,689 tons, which represents 19.4% of the waste processed by weight. The average uncorrected steam production rate for Q2FY20 was 2.96 $tons_{steam}/ton_{waste}$, which is lower (0.6%) than the corresponding quarter in FY19. The decrease in this metric is attributable to the 1.8% decrease in the quarterly average waste heating value (HHV) calculated by CAAI.

Chart 1: Tons of Waste Processed

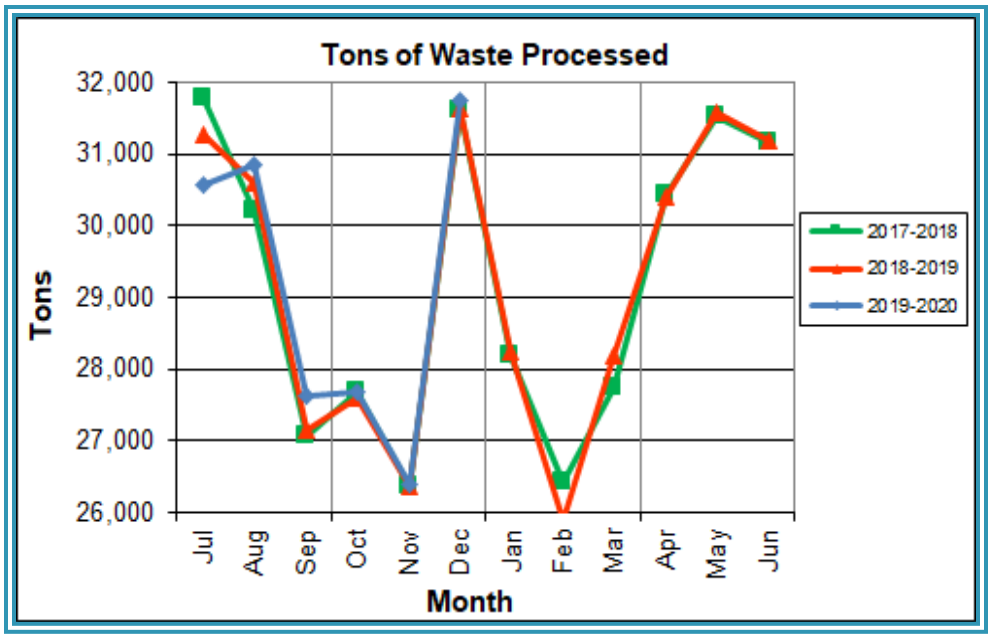


Chart 1 illustrates that Q2FY20 waste processed was slightly higher (0.3%) than the corresponding quarter, Q2FY19.

CAAI reported that 421 tipping floor/MSW internal inspections were conducted during the quarter and one (1) notice of violation (NOV) was issued to haulers in December for a safety violation due to entering the floor before being signaled in.

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

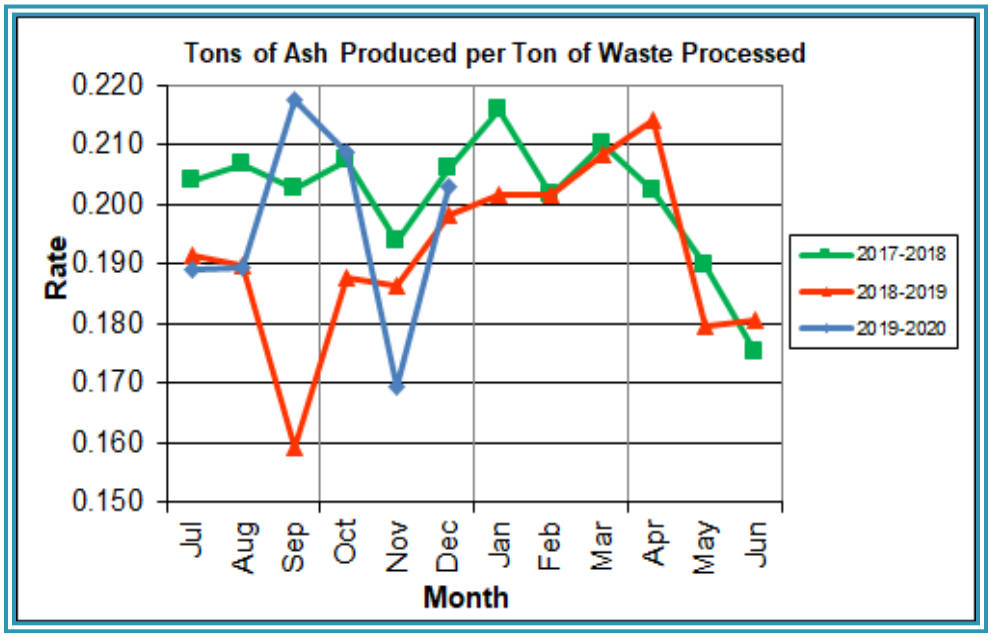


Chart 2 illustrates that the average ash production rate in Q2FY20 was higher (0.3%) at 19.4% of processed waste, compared to the corresponding quarter in FY19 when the rate was 19.1%. The increase in this metric is partially attributable to the decrease (6.8%) in ferrous metal recovery in Q2FY20 when compared to the corresponding quarter in FY19.

Chart 3: Ferrous Recovery Rate

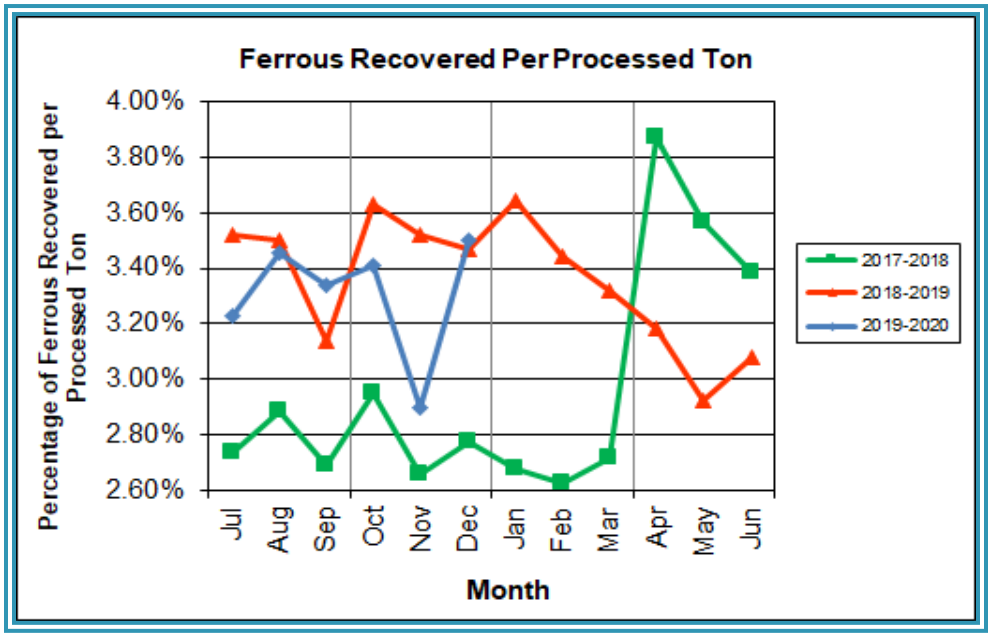
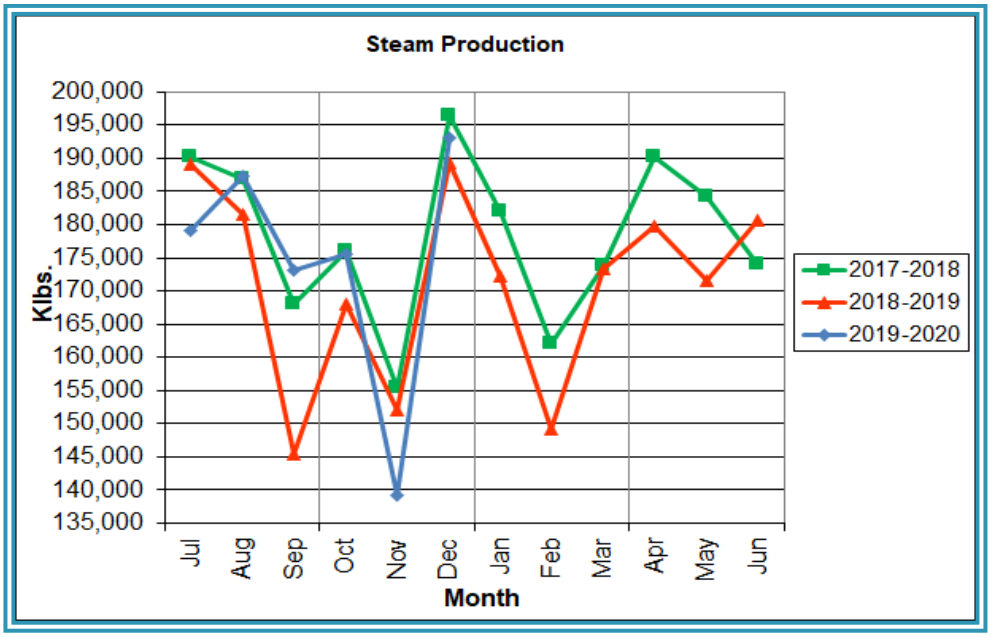


Chart 3 depicts the monthly ferrous metal recovery rate as a percentage of processed MSW tonnage. In Q2FY20, 2,820 tons of ferrous metals were recovered, which is 6.8% lower than the corresponding quarter in FY19 and equivalent to 3.3% of processed waste. CAAI reported that during Q2FY20, it continued experimental processing of the recovered metals through a trommel screen to remove some of the residual ash, which resulted in a decrease in the ferrous recovery tonnage, when compared to the corresponding quarter in FY19.

Chart 4: Steam Production



In Chart 4, the total steam production for Q2FY20 was 507,778 klbs, and slightly lower (0.3%) than the corresponding quarter in FY19. The slight decrease in steam generation is attributable to the decrease (1.8%) in waste heating value, paired with more boiler downtime (245.9 additional hours).

Chart 5: 12-Month Rolling Steam Production

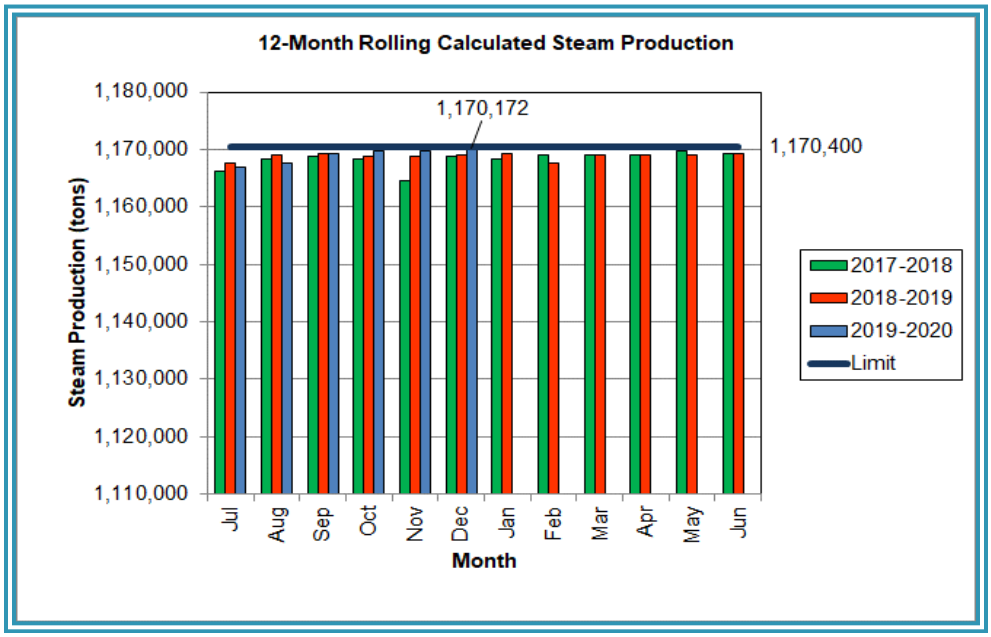
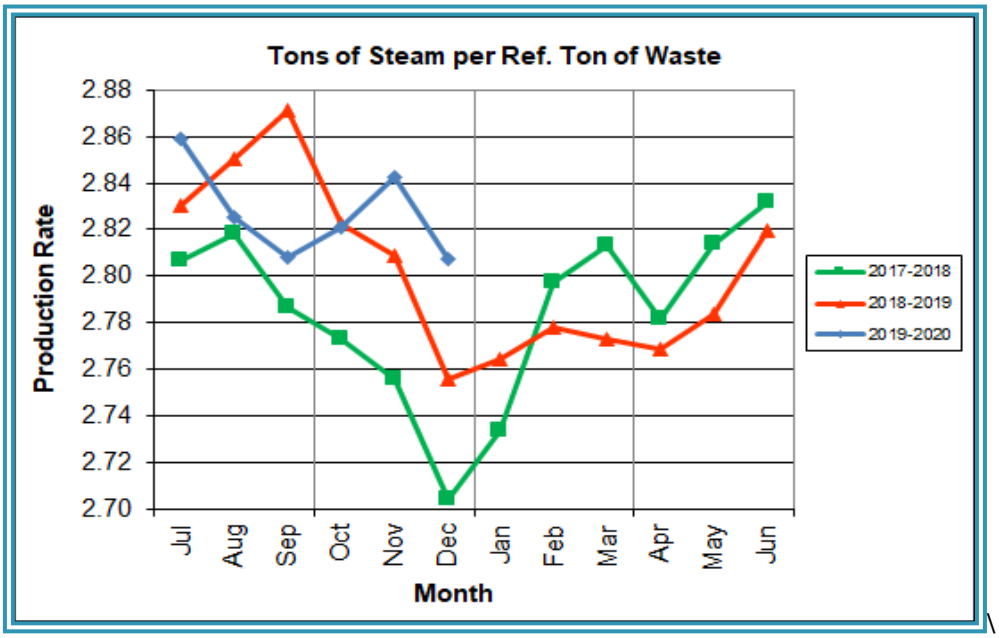


Chart 5 depicts the 12-month rolling steam production total for the quarter ending in December 2019, and for the prior two (2) fiscal years. According to the Title V permit, the annual steam production for the Facility shall not exceed 1,170,400 tons on the basis of an average value of 3.34 lbs. of steam 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 Q2FY20. The 12-month rolling total for steam production ending in December 2019 was 1,170,172 tons which is 99.9% of the limit. Chart 5 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 Q2FY20, this metric tracked higher (1.0%) at 2.82 $tons_{steam}/ton_{ref}$ compared to the corresponding quarter in FY19.

Chart 7: Calculated Waste Heating Value

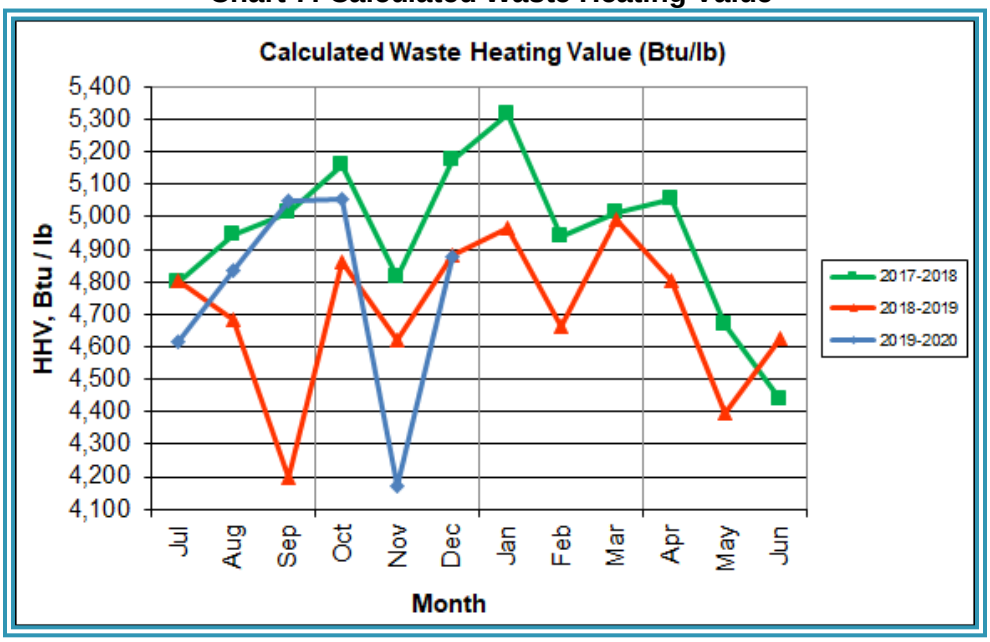


Chart 7 illustrates that Q2FY20 calculated average waste heating value was lower (1.8%) at 4,701 Btu/lb than the corresponding quarter Q2FY19, which averaged 4,788 Btu/lb. Note that the waste heating value in November 2019 of 4,172 Btu/lb was a historical low.

The disparity in average heating value of the fuel compared to the original design value established in the 1980's is one of the reasons that the annual capacity utilization is close to 100% and considerably higher than similar facilities that generally operate in the 90% range (see Section 2.0). In other words, there was sufficient conservatism in the original design of the boiler(s) and their capacity to absorb more heat, and routinely process more MSW, than they were originally rated for.

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)
Q2FY18	**Quarterly Totals**	**85,642**	**0**	**17,350**	**4,531**	**2,394**	**527,754**	**37,800**
	October -18	27,689	0	5,739	1,638	817	175,965	12,417
	November -18	26,359	0	5,107	1,554	701	155,341	10,777
	December - 18	31,594	0	6,504	1,339	876	196,448	14,606
Q2FY19	**Quarterly Totals**	**85,584**	**0**	**16,355**	**3,033**	**3,026**	**509,442**	**35,419**
	October -19	27,584	0	5,173	1,108	1,001	168,116	11,381
	November -19	26,367	0	4,909	992	928	152,101	10,268
	December – 19	31,633	0	6,273	933	1,097	189,225	13,770
Q2FY20	**Quarterly Totals**	**85,836**	**0**	**16,689**	**3,824**	2,820	**507,778**	**34,298**
	October -20	27,685	0	5,780	1,340	944	175,493	12,155
	November -20	26,393	0	4,468	1,238	764	139,112	8,187
	December - 20	31,758	0	6,441	1,246	1,112	193,173	13,956
FY20 YTD Totals		**174,882**	**0**	**34,325**	**7,650**	**5,796**	**1,047,426**	**71,537**
FY19 Totals		**350,057**	**0**	**67,068**	**11,778**	**11,756**	**2,052,153**	**142,430**
FY18 Totals		**350,087**	**0**	**70,368**	**16,431**	**10,418**	**2,139,023**	**150,506**

Table 2 presents the production data provided to HDR by CAAI for Q2FY20 on both a monthly and quarterly basis. For purposes of comparison, data for Q2FY18 and Q2FY19 are also shown, as well as FY18, FY19 and FY20 year to date totals. In comparing quarterly totals, the data shows:

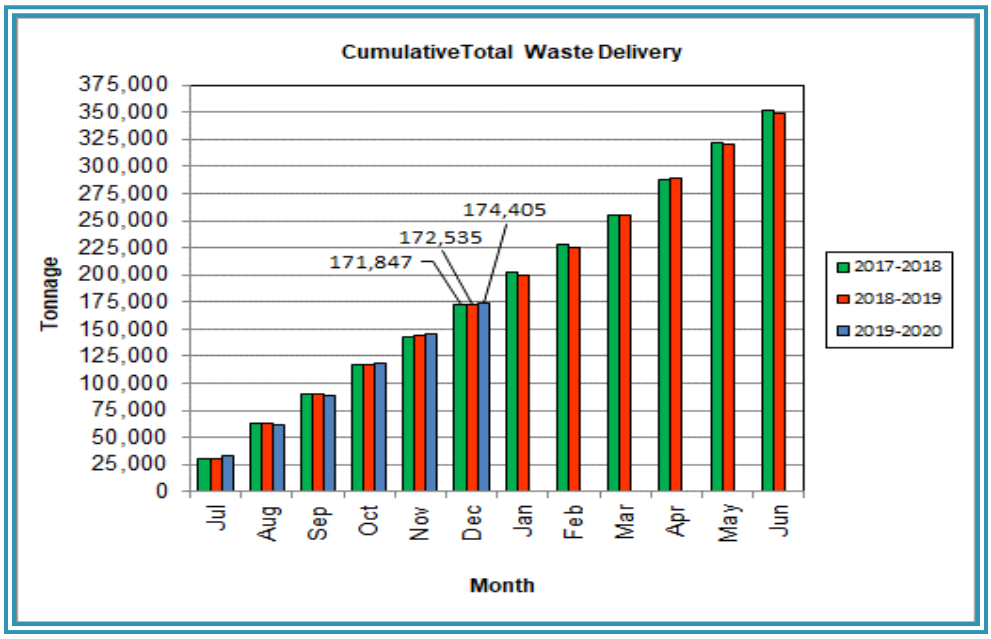
- Slightly more waste was processed in Q2FY20 than Q2FY19 and Q2FY18
- Less steam was generated in Q2FY20 than Q2FY19 and Q2FY18
- Less electricity (net) was generated in Q2FY20 than Q2FY19 and Q2FY18
- More supplemental waste was received in Q2FY20 than Q2FY19 and less than Q2FY18.

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.

Table 3: Waste Delivery Classification

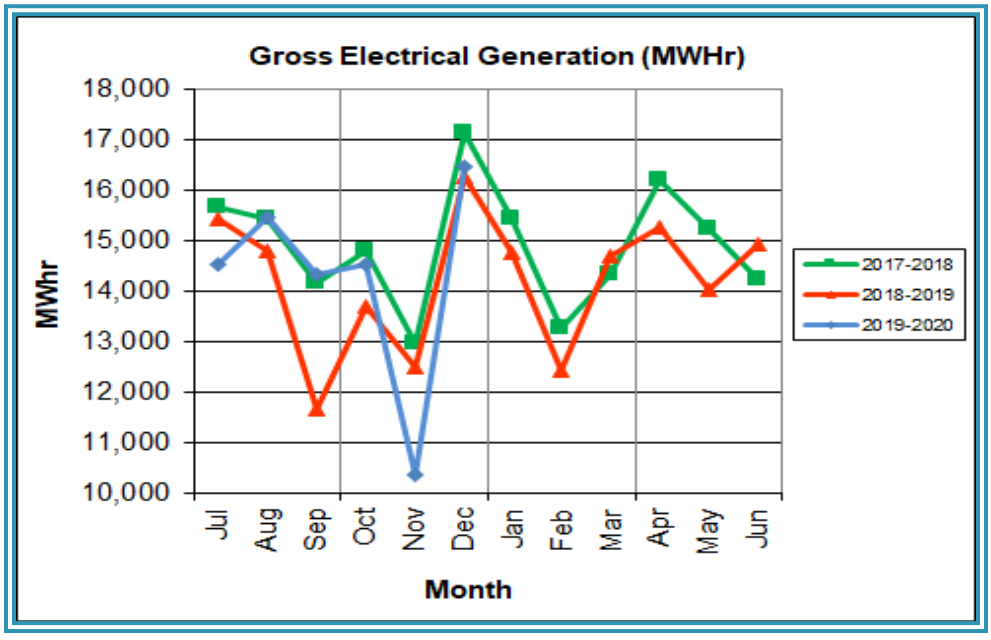
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Totals	% of Total
FY16	City Waste	1,960	1,563	1,723	1,645	1,685	1,872	1,147	1,619	1,811	2,024	1,950	2,220	21,219	6.03%
	County Waste	3,627	2,880	2,832	2,869	2,682	2,891	2,025	2,389	2,694	2,406	2,508	2,661	32,465	9.22%
	Municipal Solid Waste	27,933	22,999	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%**
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Totals	% of Total
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%**
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Totals	% of Total
FY18	City Waste	1,699	1,876	1,642	1,719	1,849	1,541	1,621	1,365	1,569	2,000	2,298	2,011	21,191	6.03%
	County Waste	2,458	2,654	2,513	2,529	2,635	2,321	2,502	2,110	2,391	2,509	2,959	2,776	30,356	8.63%
	Municipal Solid Waste	24,950	25,303	21,518	20,885	19,108	24,668	25,302	20,826	22,980	26,645	27,438	24,091	283,714	80.67%
	Supplemental Waste	1,807	1,835	1,805	1,638	1,553	1,339	1,301	884	829	886	1,391	1,161	16,430	4.67%
	MSW Totals	**30,914**	**31,668**	**27,478**	**26,772**	**25,146**	**29,869**	**30,726**	**25,185**	**27,770**	**32,040**	**34,086**	**30,039**	**351,691**	**100.00%**
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Totals	% of Total
FY19	City Waste	1,848	1,836	1,823	1,996	1,892	1,732	1,823	1,458	1,614	2,063	2,442	1,882	22,409	6.43%
	County Waste	2,560	2,798	2,554	2,656	2,746	2,439	2,567	2,165	2,336	2,586	2,989	2,686	31,081	8.92%
	Municipal Solid Waste	25,442	25,920	21,873	21,678	21,472	23,046	21,455	21,975	24,323	28,361	25,444	22,197	283,185	81.27%
	Supplemental Waste	1,012	1,040	1,138	1,108	992	933	964	743	885	895	1,038	1,029	11,777	3.38%
	MSW Totals	**30,862**	**31,595**	**27,388**	**27,438**	**27,102**	**28,150**	**26,808**	**26,342**	**29,157**	**33,904**	**31,913**	**27,793**	**348,454**	**100.00%**
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Totals	% of Total
FY20	City Waste	2,070	1,771	1,726	1,894	1,742	1,844							11,046	6.33%
	County Waste	3,069	2,600	2,544	2,664	2,507	2,575							15,960	9.15%
	Municipal Solid Waste	26,033	23,287	22,129	23,644	20,837	23,822							139,750	80.13%
	Supplemental Waste	1,269	1,321	1,236	1,340	1,238	1,246							7,650	4.39%
	MSW Totals	**32,440**	**28,979**	**27,634**	**29,541**	**26,324**	**29,487**							**174,406**	**100.00%**

Chart 8: Cumulative Total Waste Delivery



As depicted in Table 3 and Chart 8, for the quarter ending in December 2019 cumulative total waste delivery was 1.1% higher compared to the same period in FY19.

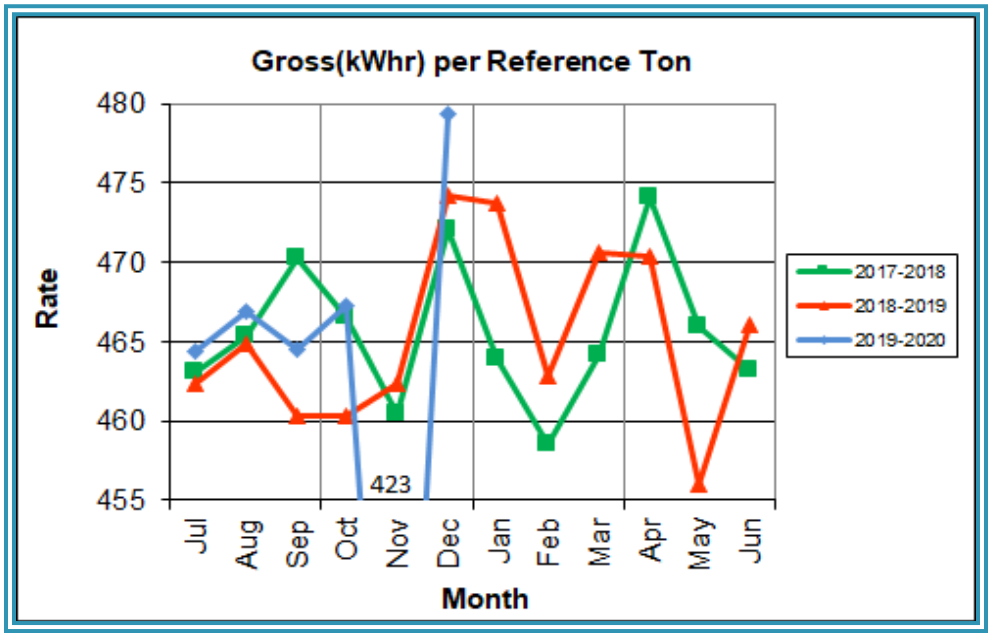
Chart 9: Gross Electrical Generation



During Q2FY20, the Facility generated 41,376 MWhrs (gross) of electricity compared to Q2FY19 generation of 42,509 MWhrs (gross), a 2.7% decrease. The decrease in electricity generated (gross) in Q2FY20, is attributable to slightly lower

steam production, paired with more downtime (509.0 additional hours) experienced by the turbine generators. Note that the sharp spikes depicted in Chart Nos. 10 through 13 for November 2019 are a result of significant downtime (635.0 hours) experienced by Turbine Generator No. 1 for a Turbine Generator No. 1 Scheduled Major Overhaul.

Chart 10: Gross Conversion Rate



As shown in Chart 10, the average gross electrical generation per reference ton of refuse processed during Q2FY20 was 457 kWhr, which is lower (2.0%) than the corresponding quarter in FY19. 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

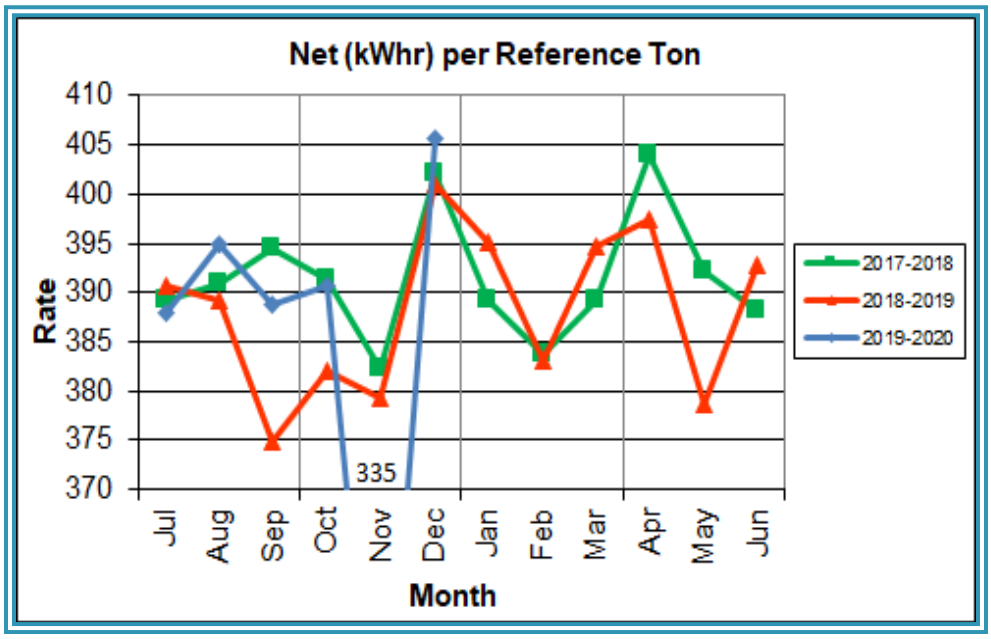


Chart 11 depicts the normalized net power (gross minus in-house usage) generation history. In Q2FY20, the average net electrical generation per reference ton was 377 kWhr, which is 2.7% lower than the corresponding quarter in FY19.

Chart 12: Net Conversion Rate

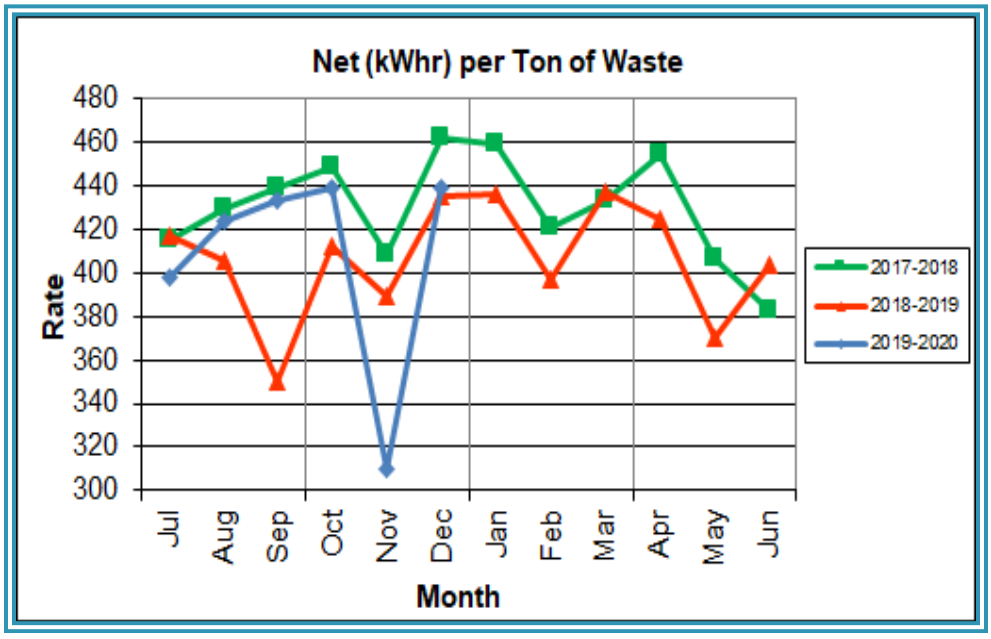


Chart 12 depicts the net power generation per processed ton. The net electrical generation per processed ton in Q2FY20 was 396 kWhr, which is 3.9% lower than the corresponding quarter in FY19 and is attributable to the decrease (1.8%) in

waste heating value, and significantly more downtime by Turbine Generator No. 1 in November 2019 for the scheduled major overhaul.

Chart 13: Gross Turbine Generator Conversion Rate

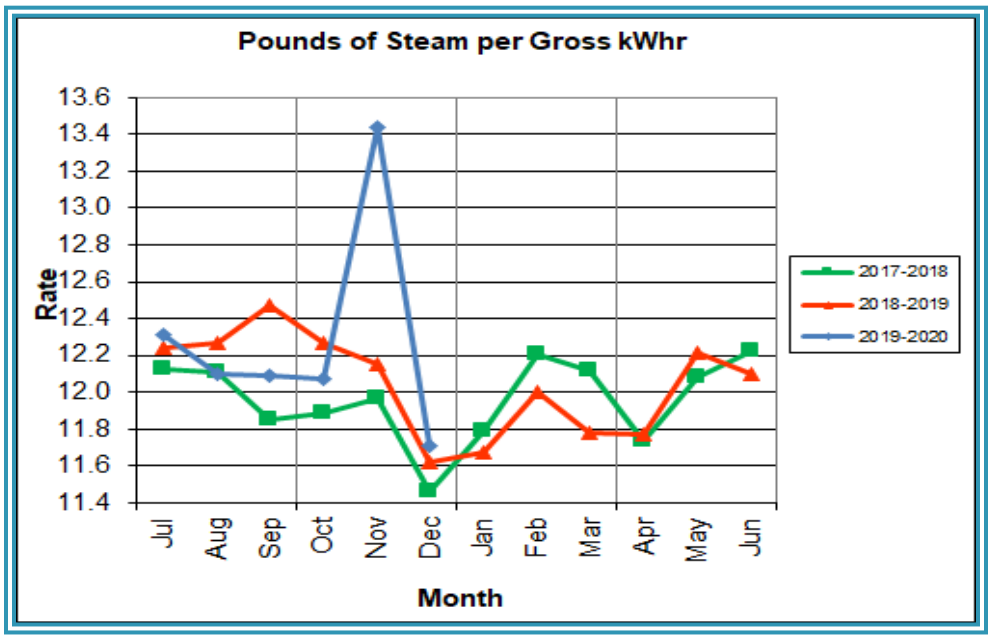


Chart 13 illustrates the quantities of steam required to generate one (1) kWhr of electricity. This measure is a turbine generator performance indicator, where lower steam rates indicate superior performance. For simplification, this calculated rate is based on the average for the two turbine generators. In Q2FY20 the average lbs of steam consumed per gross kWhr generated was 12.3, which is 2.4% higher (less efficient) than the corresponding quarter Q2FY19. A factor that negatively impacts this metric is Turbine Generator No. 2 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 main steam temperature during the quarter was 678.4°F, which is 6.7°F higher than the average main steam temperature of the corresponding quarter last fiscal year and 21.6°F lower than design temperature of 700°F.

4.1 Utility and Reagent Consumptions

Table 4: Facility Utility and Reagent Consumptions

Utility	Units	Q2FY20 Total	Q2FY19 Total	Q2FY20"Per Processed Ton" Consumption	Q2FY19"Per Processed Ton" Consumption	FY20 YTD Total
Purchased Power	MWhr	5,629	5,602	0.0656	0.0655	11,191
Fuel Oil	Gal.	9,640	14,340	0.11	0.17	24,460
Boiler Make-up	Gal.	2,567,000	1,515,000	29.91	17.70	4,032,000
Cooling Tower Make-up	Gal.	32,883,491	29,037,973	383.10	339.29	78,546,207
Pebble Lime	Lbs.	1,304,000	1,374,000	15.19	16.05	2,738,000
Ammonia	Lbs.	171,000	154,000	1.99	1.80	349,000
Carbon	Lbs.	72,000	78,000	0.84	0.91	144,000
Dolomitic Lime	Lbs.	0	116,000	0.00	1.36	0

Fuel oil usage during the quarter represents approximately 0.17% of the total heat input to the boilers, which compares favorably with industry averages, and is slightly lower than the percentage of heat input in Q2FY19 which was 0.26%. 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 4.2% of steam flow, which is higher than the boiler makeup in Q2FY19 which was 2.5% of steam flow. Pebble lime usage, at 1,304,000 lbs. is lower (5.1%) than the corresponding quarter last year, and attributable to more boiler downtime (245.9 additional hours) during the quarter. During Q2FY19, CAAI reported that it was discontinuing dolomitic lime feed, while increasing lime slurry feed in an effort to stabilize the ash pH to levels that will minimize dolomitic lime to condition the ash going forward. Ash pH levels in the range of 8 to 11 are desirable to minimize leaching potential of heavy metals.

In comparing Q2FY20 to Q2FY19 on a per processed ton consumption basis:

- the purchased power consumption rate was 0.2% higher
- the total fuel oil consumption rate was 33.0% lower
- the boiler make-up water consumption rate was 68.9% higher
- the cooling tower make-up water consumption rate was 12.9% higher
- the total pebble lime consumption rate was 5.4% lower
- the ammonia consumption rate was 10.7% higher
- the carbon consumption rate was 8.0% lower

- the total dolomitic lime consumption rate was 100.0% lower, as no dolomitic lime was fed during the quarter

The decrease in carbon consumption during the quarter was primarily attributable to the Facility demonstrating compliance with mercury and dioxin/furan emissions limits during 2019 Stack Testing (March 2019) at a minimum feed rate of 12.0 lbs. per hour, rather than a minimum of 13.0 lbs. per hour which was demonstrated in 2018.

4.2 Safety & Environmental Training

The Facility experienced no OSHA recordable accidents or First Aid accidents during the quarter. CAAI has operated 645 days without an OSHA recordable accident as of December 31, 2019. Safety and Environmental training was conducted with themes as follows:

October 2019

- Safety:
  - Boiler Fouling
  - Ergonomics Pushing and Pulling
- Environmental:
  - APC Equipment and Reagents
  - Ash Handling

November 2019

- Safety:
  - Machine Guarding
  - Air Lance and Pressure Washer Safety
  - What if? – Scenario for non-Covanta Intruder
  - Hand and Finger Injuries and Prevention
- Environmental:
  - Review of Spill Prevention, Control and Countermeasure Plan (SPCC) and Accidental Spill and Slug Control Plan (Slug Plan)
  - Screening Waste Loads and Handling of Unacceptable Waste
  - Environmental Compliance During Outages

December 2019

- Safety:
  - Rigging
  - Hazard Recognition
  - Hazard Recognition During Outages
- Environmental:
  - Root Cause Analysis of Opacity and Particulate Matter Excursions

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 31, 2019 Boiler No. 2 experienced 372.3 hours of downtime for a Fall 2019 Scheduled Major Boiler Outage, and beginning on November 20, 2019, Boiler No. 3 experienced 22.4 hours of downtime, both for a scheduled cleaning outage. Some significant activities that were completed during the outage are:

- Installation of the Low NO_X (LN^{TM}) Technology including:
  - New automated control damper, positioner, associated power and control wiring, and DCS I/O modules on the front and rear OFA header supplies
  - Tertiary nozzles on left and right side wall in upper furnace
  - Ductwork from existing combustion air system to new tertiary nozzles
  - Flow measurement device and transmitter
  - Tertiary Control Damper and positioner
  - Pressure Sensing Elements and transmitter
  - Various local instrumentation, valves, dampers, and associated tubing and wiring

    - Control system design and programming to integrate the system into existing combustion and SNCR controls
    - Replacement of the front wall ignition roof tube panel
    - Replacement of the upper rear bullnose tube panel in the furnace
- Replacement of four (4) soot blower elements (G9B Nos. 1, 2, 3, and 10)
- Replacement of 18 tube shields in the superheater section and two (2) hangers
- Replacement of the ash discharger mud flap and also six (6) transverse wall liner plates
- Replacement of the riddling chutes on both sides from Zone 4 to the ash discharger penetrations
- Replacement of six (6) grate bars – three (3) on Run No. 1, and three (3) on Run No. 2
- Replacement of one (1) center division block
- Replacement of the broken movable carrier beam mounting bracket in Zone No. 3 on the Run No. 1 Side
- Installation of Stoker Programmable Logic Controls (PLCs)

Beginning November 3, 2019 Turbine Generator No. 1 experienced 540.5 hours of downtime for a scheduled Major Turbine Generator Overhaul. Some significant activities that were completed during the overhaul are:

- Full disassembly of Turbine Generator No. 1
- Performed sandblasting and inspection of the turbine rotor
- Removal and testing of the generator rotor
- Conducted lube oil flush and flush of the lube oil coolers
- Cleaned the generator cooler
- Sandblasting and inspection of the diaphragms
- Testing of the eddy current in the Condenser
- Replacement of the air ejector nozzles
- Installation of Automatic Voltage Regulator

In addition to the scheduled outages, CAAI reports that 971 preventative maintenance actions were completed during the quarter.

5.1 Availability

Facility availabilities for Q2FY20 are shown in Table 5. According to CAAI reports, the average unit availabilities for Boiler Nos. 1, 2, and 3 for Q2FY20 were 99.0%, 82.8%, and 99.4%, respectively. The three-boiler average availability during the quarter was 93.7%, which is comparable to that of mature, well run waste to energy facilities.

According to CAAI reports, the average unit availabilities for Turbine Generator Nos. 1 and 2 for Q2FY20 was 70.5% and 100.0%, respectively. The turbine generator average availability during the quarter was 85.3% and was negatively impacted by the Turbine Generator No. 1 scheduled major overhaul in November 2019. Note that the reported availability metrics exclude standby time experienced which amounted to 11.2 hours for Turbine Generator No. 2.

Table 5: Quarterly Facility Unit Availabilities

Availability	Q1FY20 Average	Q2FY20 Average	FY20 YTD Average
Boiler No. 1	95.9%	99.0%	97.5%
Boiler No. 2	96.3%	82.8%	89.6%
Boiler No. 3	97.4%	99.4%	98.4%
Avg.	***96.6%***	***93.7%***	***95.1%***
Turbine No. 1	100.0%	70.5%	85.3%
Turbine No. 2	100.0%	100.0%	100.0%
Avg.	***100.0%***	***85.3%***	***92.6%***

Table 6: Boiler Downtime – Q2FY20

Boiler Number	Outage Begin Date	Outage End Date	Hours Unavailable	Downtime Classification	Reason Unavailable
3	10/29/19	10/29/19	23.5	Standby	Process Limitations – 12-Month Rolling Average
2	10/30/19	10/30/19	16.3	Standby	Process Limitations – 12-Month Rolling Average
2	10/31/19	11/15/19	372.3	Scheduled	Fall 2019 Scheduled Major Boiler Outage
1	11/20/19	11/21/19	22.4	Scheduled	Scheduled Cleaning Outage
3	11/25/19	11/25/19	12.0	Unscheduled	Replacement of Outboard Induced Draft Fan Bearing
Total Unscheduled Downtime				**12.0 Hours**	
Total Scheduled Downtime				**394.7 Hours**	
Total Standby Downtime				**39.8 Hours**	
Total Downtime				**446.5 Hours**	

Table 7: Turbine Generator Downtime – Q2FY20

Turbine Generator Number	Outage Begin Date	Outage End Date	Hours Unavailable	Downtime Classification	Reason Unavailable
1	11/3/19	11/25/19	540.5	Scheduled	Scheduled Major Turbine Generator Overhaul
1	11/26/19	11/27/19	48.0	Unscheduled	Turbine – Mechanical – Outage Extension
1	11/28/19	11/28/19	24.0	Unscheduled	Lube Oil System – Turbine – Outage Extension
1	11/29/19	11/30/19	22.5	Unscheduled	Turbine Generator Vibration – Outage Extension
Total Unscheduled Downtime				**94.5 Hours**	
Total Scheduled Downtime				**540.5 Hours**	
Total Standby Downtime				**0.0 Hours**	
Total Downtime				**635.0 Hours**	

5.2 Facility Housekeeping

CAAI is performing Facility housekeeping and maintaining plant cleanliness in accordance with acceptable industry practices. A site inspection was conducted in November 2019. 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 2019 inspection are presented in Table 8.

Table 8: Facility Housekeeping Ratings – November 2019

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 Q2FY20 are summarized in Appendix A. The Facility experienced one (1) permit deviation during the Q2FY20 on December 7, 2019 when the Boiler No. 3 4-hour Carbon Monoxide average reached 151 ppm (100 ppm limit) due to a malfunction on the Induced Draft Fan damper vane. This excess emission event was considered exempt under startup/shutdown/malfunction rules. Note that prior to the exceedance, the Facility operated 781 days without an environmental excursion.

6.1 Low NO_x Technology Implementation

The Virginia Department of Environmental Quality (VADEQ) has issued the final RACT permits for the installation and operation of LN™ Technology. During November 2019, Boiler No. 2 was retrofitted with LN™ Technology, including the installation of all associated ductwork, nozzles, and controls and CAAI reports that

final calibration of instrumentation is tentatively scheduled for late February 2020. CAAI stated that it plans to install the LN™ Technology on subsequent units in the second quarters of Fiscal Years 2021 and 2022.

6.2 Nitrogen Oxide Emissions

During Q2FY20, the monthly emission concentrations of nitrogen oxides (NO_x) averaged 159.0 ppmdv, 159.7 ppmdv, and 159.3 ppmdv for Boiler Nos. 1, 2, and 3, respectively. As previously mentioned, the LN™ Technology was installed on Boiler No. 2 in November 2019, and CAAI has indicated that the system will undergo a period of calibration and optimization through next quarter. CAAI continued to operate the boilers at the lower (160 ppmdv) set-points through Q2FY20.

6.3 Sulfur Dioxide Emissions

During Q2FY20 the monthly emission concentration of stack sulfur dioxide (SO_2) averaged 0.7 ppmdv, 2.3 ppmdv, and 1.0 ppmdv for Boiler Nos. 1, 2, and 3, respectively. All of these stack SO_2 concentrations are significantly below the permit limit of 29 ppmdv @ 7% O_2.

6.4 Carbon Monoxide Emissions

During Q2FY20, the monthly average CO emission concentrations on Boiler Nos. 1, 2, and 3 were 31.3 ppmdv, 34.0 ppmdv, and 26.0 ppmdv, respectively, and all are well within permit limits (100 ppmdv, hourly average).

6.5 Opacity

During Q2FY20, the average opacity on Boiler Nos. 1, 2, and 3 were 0.4%, 0.9%, and 0.4%, respectively, which are all significantly below the 10% (6-minute) average permit limit.

6.6 Daily Emissions Data

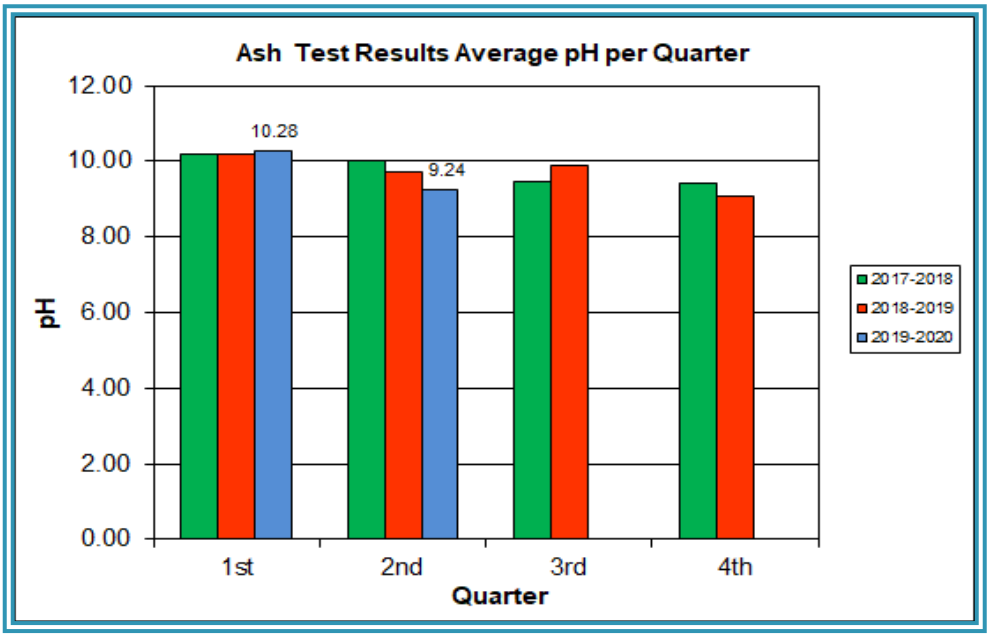
Appendix A, Tables 9, 10, and 11 tabulate the monthly average, maximum, and minimum emissions data for each unit during Q2FY20. Excursions, if any, would

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.

6.7 Ash System Compliance

During Q2FY19, CAAI reported that it was discontinuing dolomitic lime feed, while increasing lime slurry feed in an effort to stabilize the ash pH to levels that will allow eliminating dolomitic lime to condition the ash going forward. The desired ash pH level ranges from 8.0 to 11.0. Ash Toxicity (TCLP) tests were not performed during Q2FY20. In addition to periodic TCLP tests, 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 14 where each quarter is represented by the average of the respective monthly readings. During Q2FY19, the average ash pH for in-house tests was 9.2.

Chart 14: Quarterly Ash Test Results



APPENDIX A
FACILITY CEMS DATA

Table 9: 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.		SteamFl	SO_2ec	SO_2sc	COsc	NO_xsc	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 - 19	AVG	81.3	24.0	0.0	31.0	159.0	0.1	300.0	12.3	3.4
	Max	88.7	35.0	1.0	52.0	161.0	0.4	301.0	12.4	3.8
	Min	65.0	12.0	0.0	16.0	156.0	0.0	295.0	12.3	2.7
Nov - 19	AVG	78.6	27.0	1.0	29.0	160.0	0.4	300.0	12.3	3.2
	Max	86.9	79.0	5.0	42.0	162.0	0.6	300.0	12.4	3.8
	Min	65.2	8.0	0.0	15.0	158.0	0.2	297.0	12.2	2.6
Dec - 19	AVG	86.4	27.0	1.0	34.0	160.0	0.8	300.0	12.3	3.7
	Max	89.9	59.0	4.0	46.0	165.0	1.2	301.0	12.5	3.9
	Min	76.0	14.0	0.0	22.0	158.0	0.4	300.0	12.2	3.0
Quarter Average		82.1	0.0	0.7	31.3	159.7	0.4	300.0	12.3	3.4
Quarter Max Value		89.9	79.0	5.0	52.0	165.0	1.2	301.0	12.5	3.9
Quarter Min Value		65.0	8.0	0.0	15.0	156.0	0.0	295.0	12.2	2.6
Limits:		98	NA	29	100	205	10	331	12(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 10: 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.		SteamFl	SO_2ec	SO_2sc	COsc	NO_xsc	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 - 19	AVG	80.2	18.0	2.0	33.0	159.0	0.9	300.0	12.3	3.5
	Max	87.3	27.0	3.0	44.0	161.0	1.3	301.0	12.4	3.9
	Min	64.5	11.0	0.0	19.0	157.0	0.5	295.0	12.3	2.7
Nov - 19	AVG	76.3	54.0	4.0	32.0	160.0	0.7	301.0	12.3	3.2
	Max	85.7	77.0	15.0	37.0	162.0	1.0	301.0	12.3	3.6
	Min	73.3	44.0	1.0	19.0	158.0	0.5	300.0	12.3	2.8
Dec - 19	AVG	85.9	31.0	1.0	37.0	160.0	0.9	301.0	12.3	3.8
	Max	88.5	67.0	6.0	46.0	162.0	1.2	301.0	12.4	4.0
	Min	81.1	17.0	0.0	29.0	158.0	0.6	300.0	12.2	3.5
Quarter Average		80.8	34.3	2.3	34.0	159.7	0.8	300.7	12.3	3.5
Quarter Max Value		88.5	77.0	15.0	46.0	162.0	1.3	301.0	12.4	4.0
Quarter Min Value		64.5	11.0	0.0	19.0	157.0	0.5	295.0	12.2	2.7
Limits:		98	NA	29	100	205	10	330	12(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 #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.		SteamFl	SO_2ec	SO_2sc	COsc	NO_xsc	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 - 19	AVG	80.3	24.0	0.0	24.0	159.0	0.1	298.0	12.3	3.4
	Max	88.0	39.0	2.0	34.0	165.0	0.5	299.0	12.5	3.8
	Min	66.0	14.0	0.0	11.0	157.0	0.0	293.0	12.3	2.7
Nov - 19	AVG	77.2	27.0	1.0	23.0	160.0	0.7	298.0	12.3	3.2
	Max	85.6	48.0	3.0	36.0	164.0	1.4	298.0	13.3	3.8
	Min	63.8	18.0	0.0	5.0	159.0	0.1	297.0	12.3	2.6
Dec - 19	AVG	86.2	20.0	2.0	31.0	159.0	0.4	298.0	12.3	3.7
	Max	90.5	39.0	5.0	47.0	164.0	1.1	299.0	12.9	4.0
	Min	81.2	10.0	0.0	23.0	156.0	0.0	297.0	12.2	3.3
Quarter Average		81.2	23.7	1.0	26.0	159.3	0.4	298.0	12.3	3.4
Quarter Max Value		90.5	48.0	5.0	47.0	165.0	1.4	299.0	13.3	4.0
Quarter Min Value		63.8	10.0	0.0	5.0	156.0	0.0	293.0	12.2	2.6
Limits:		98	NA	29	100	205	10	332	12a)	

(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 2019

Figure 1: Windows missing/damaged on Tipping Floor – New Deficiency

Figure 2: New nozzle installation in upper elevation of Boiler – Boiler No. 2 LN™ Technology Installation

Figure 3: New ductwork – Boiler No. 2 LN™ Technology Installation

Figure 4: New larger Over Fire Air Fan – Boiler No. 2 LN™ Technology Installation

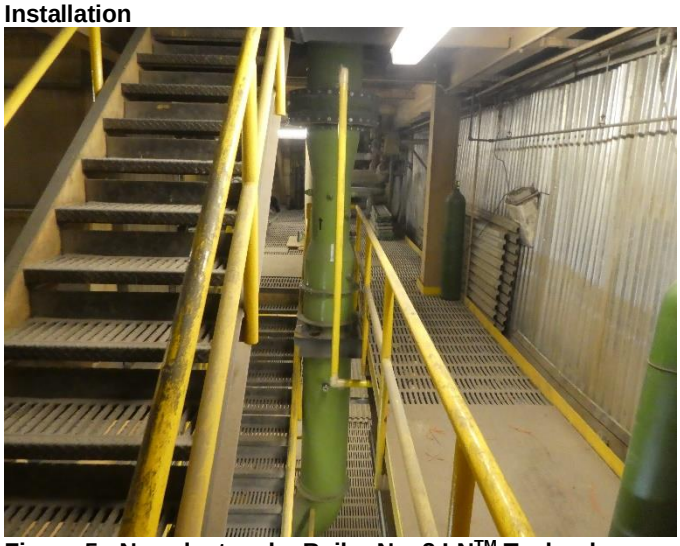


Figure 5: New ductwork– Boiler No. 2 LN™ Technology Installation

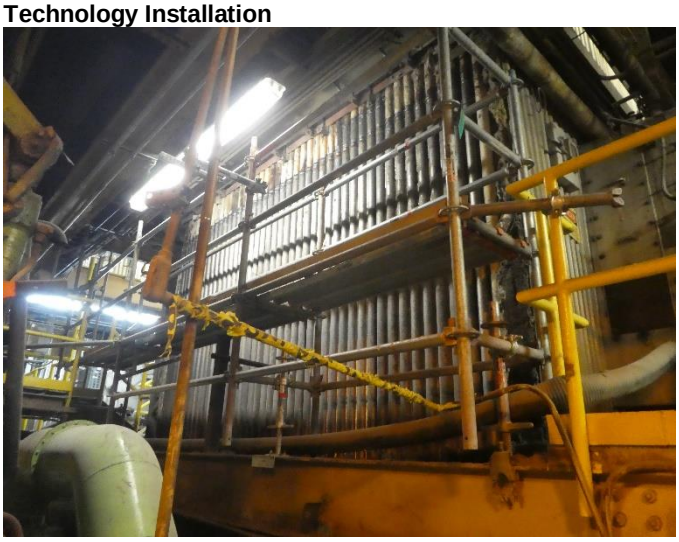


Figure 6: New boiler tube panels installed – bullnose and ignition roof replaced – Boiler No. 2 Outage

Figure 7: New ductwork above feed table– Boiler No. 2 LN™ Technology Installation

Figure 8: Grates and Scaffolding Installed – Boiler No. 2 Outage

Figure 9: Turbine Deck Overview Photo – Turbine Generator No. 1 Overhaul In-Progress

Figure 10: Upper Shell Removed – Turbine Generator No. 1 Overhaul

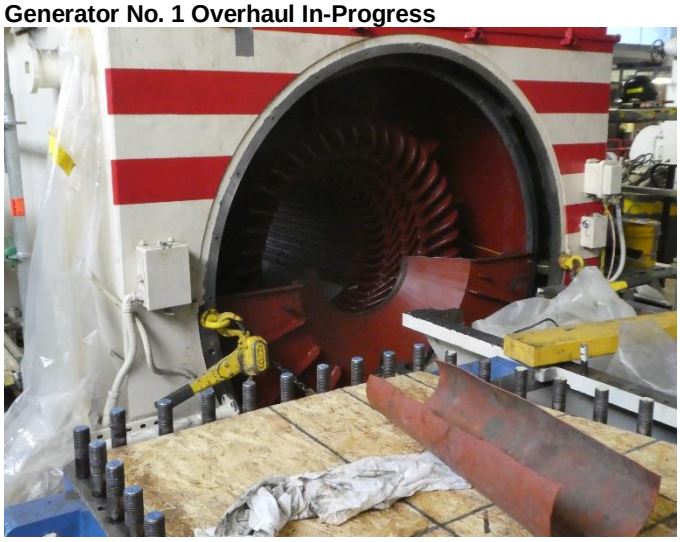


Figure 11: Generator Stator – Turbine Generator No.1 Overhaul

Figure 12: Generator Rotor Removed for Inspection and Testing – Turbine Generator No. 1 Overhaul

Figure 13: Journal Bearing Housing & Packing Removed for Inspection – Turbine Generator No. 1 Overhaul

Figure 14: Turbine Rotor Removed for Sandblasting and Inspection – Turbine Generator No. 1 Overhaul

Figure 15: Turbine Diaphragms Removed for Inspection and Sandblasting – Turbine Generator No. 1 Overhaul

Figure 16: Lower Half Shell – Turbine Rotor Removed – Turbine Generator No. 1 Overhaul

Figure 17: Generator Exciter Removed – Turbine Generator No. 1 Overhaul

Figure 18: New Automatic Voltage Regulator Cabinet Installation in Control Room – Turbine Generator No. 1 Overhaul

Figure 19: New Feeder Controls Installed – Boiler No. 2 Outage

Figure 20: New Concrete – Southeast Corner of Ash Trailer Canopy

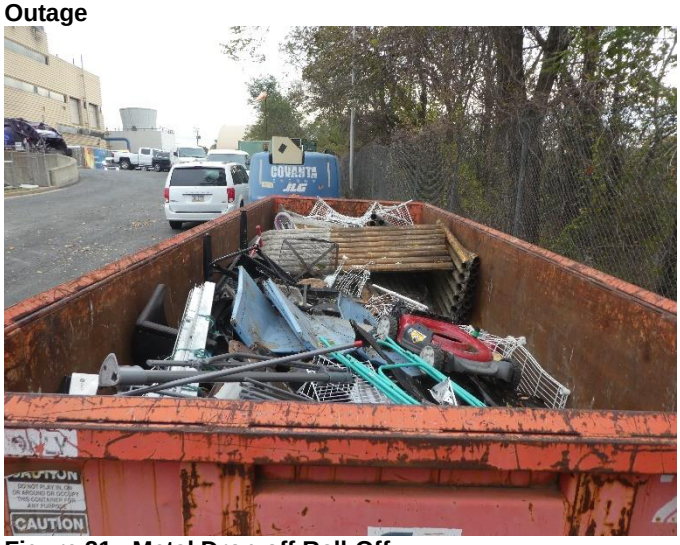


Figure 21: Metal Drop-off Roll-Off

Figure 22: Citizen's Drop-off Roll-off

Figure 23: New Stoker Programmable Logic Controls Installation In-Progress – Boiler No. 2 Outage

Figure 24: New Concrete – Scale Exit

Figure 25: Tipping Floor Center Bay Surface Replaced – Approximately 800 ft²

Figure 26: New Concrete – Scale Entrance

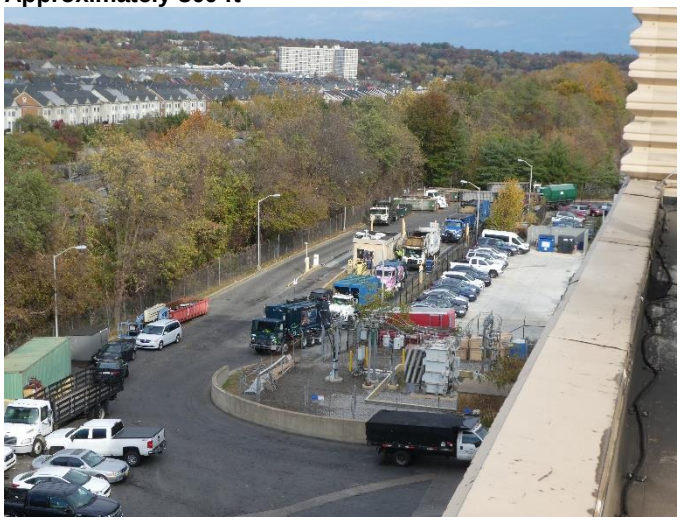


Figure 27: Inbound Waste Delivery Queuing at Scales and Tipping Floor Entrance

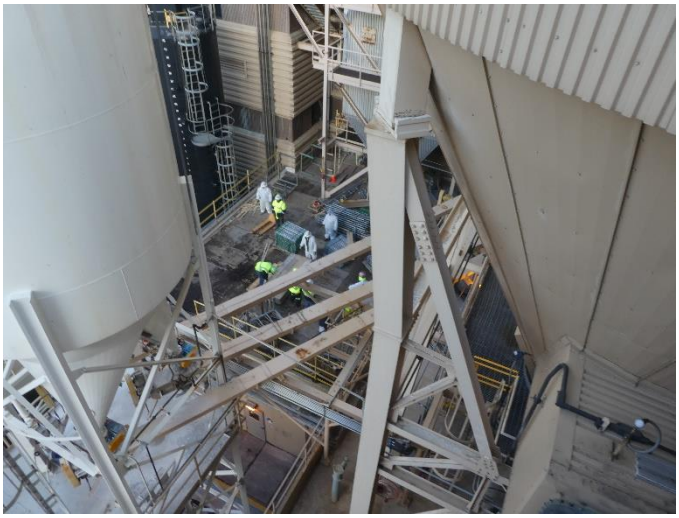


Figure 28: Scaffolding being removed from SDA No. 2 Vessel – Boiler No. 2 Outage

Figure 29: Ferrous Drum Magnet & Pan – Minimal Gap

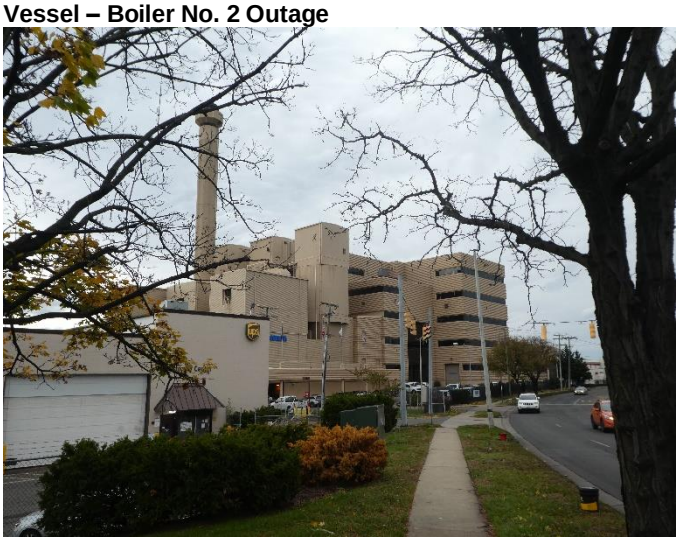


Figure 30: General Facility Photo - Southwest Corner of Facility