Alexandria Arlington Resource Recovery Facility

Fiscal Year 2022

First Quarter Operations Report

February 2022

Prepared by:

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

Table of Contents

Section No. Page No.

1.0 PURPOSE OF REPORT 4
2.0 EXECUTIVE SUMMARY 4
3.0 FACILITY INSPECTION AND RECORDS REVIEW 5
4.0 FACILITY PERFORMANCE 9
4.1 Utility and Reagent Consumptions 21
4.2 Safety & Environmental Training 21
5.0 FACILITY MAINTENANCE 23
5.1 Availability 24
5.2 Facility Housekeeping 25
6.0 ENVIRONMENTAL 26
6.1 Low NO_x Technology Implementation 26
6.2 Nitrogen Oxide Emissions 26
6.3 Sulfur Dioxide Emissions 27
6.4 Carbon Monoxide Emissions 27
6.5 Opacity 27
6.6 Daily Emissions Data 27
6.7 Ash System Compliance 28

APPENDIX A FACILITY CEMS DATA 29

Front Cover Photos

Top: General Facility Photo – from southwest corner on Eisenhower Avenue
Middle: Firing Aisle
Bottom: New Over Fire Air Fan – Boiler No. 3 LN™ Technology Installation

List of Tables

Table 1: Summary of Inspection Report Deficiencies 7
Table 2: Quarterly Performance Summaries 15
Table 3: Waste Delivery Classification 16
Table 4: Facility Utility and Reagent Consumptions 21
Table 5: Quarterly Facility Unit Availabilities 24
Table 6: Boiler Downtime – Q2FY22 24
Table 7: Turbine Generator Downtime – Q2FY22 25
Table 8: Facility Housekeeping Ratings – November 2021 25
Table 9: Unit #1 Monthly Summary for Reportable Emissions Data 30
Table 10: Unit #2 Monthly Summary for Reportable Emissions Data 31
Table 11: Unit #3 Monthly Summary for Reportable Emissions Data 32

List of Charts

Chart 1: Tons of Waste Processed 9
Chart 2: Tons of Ash Produced per Ton of Waste Processed 10
Chart 3: Ferrous Recovery Rate 10
Chart 4: Steam Production 11
Chart 5: 12-Month Rolling Steam Production 12
Chart 6: Steam Production Rate 13
Chart 7: Calculated Waste Heating Value 14
Chart 8: Cumulative Total Waste Delivery 17
Chart 9: Gross Electrical Generation 17
Chart 10: Gross Conversion Rate 18
Chart 11: Net Conversion Rate 19
Chart 12: Net Conversion Rate 19
Chart 13: Gross Turbine Generator Conversion Rate 20
Chart 14: Quarterly Ash Test Results 28

List of Figures

Figure 1: The upper level furnace camera on Unit 3 was removed. The port that the camera was installed remains open 34
Figure 2: New Over Fire Air Fan – Boiler No. 3 LN™ Technology Installation 34
Figure 3: Firing Aisle 34
Figure 4: New Particulate Matter (PM) Monitors 34
Figure 5: Ferrous Drum Magnet 34
Figure 6: Refuse Pit 34

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 2022

1.0 Purpose of Report

HDR Engineering, Inc. (HDR) was authorized by the Facility Monitoring Group (FMG) to conduct quarterly site assessments and provide quarterly reports regarding the operation and maintenance of the Covanta Alexandria/Arlington Waste-to-Energy Facility (Facility) for the 2022 Fiscal Year. This report is prepared for the second quarter of the 2022 fiscal year and summarizes Facility operations between October 1, 2021, and December 31, 2021. This report identifies the fiscal year beginning on July 1, 2021, as FY22 and the quarter beginning on October 1, 2021, as Q2FY22.

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 Q2FY22. The entire quarter was subject to additional protocols per Covanta corporate direction to address the Coronavirus Pandemic. The operation of the Facility, maintenance, safety, and overall cleanliness continue to be above average. Environmental performance was acceptable with one (1) permit deviation experienced during the quarter.

During Q2FY22, the boilers experienced two (2) instances of unscheduled downtime totaling 49.7 hours, and the turbine generators experienced no unscheduled downtime. Boiler Nos. 1 and 2 experienced scheduled cleaning outages during the quarter totaling 195.7 hours of downtime. The boilers experienced two (2) instances of standby downtime totaling 284.7 hours and the

turbine generators experienced two (2) instances of standby downtime totaling 50.9 hours. A detailed listing of downtime is provided in Section 5.1 of this report.

Average waste processed during the quarter was 935.9 tons per day, or 96.0% of nominal facility capacity. Waste deliveries averaged 924.9 tons per day, which is higher (1.2%) 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 higher (0.3%) compared to the corresponding quarter in FY21; steam production increased (5.2%), and electricity generated (gross) increased (4.4%) from the corresponding quarter in FY21. The increase in steam generation is attributable to the increase in waste heating value (4.2%), offset by more boiler downtime (145.7 additional hours). The increase in electricity generated (gross) in Q2FY22 is attributable to higher (5.2%) steam production and less turbine generator downtime (22.6 fewer hours).

3.0 Facility Inspection and Records Review

In November 2021, HDR met with the Facility management and other plant personnel to discuss Facility operations and maintenance, perform an independent visual inspection of the operating Facility, photograph areas of interest, and perform a review of recent Facility activity. HDR obtained operating data and monthly reports electronically from CAAI throughout the quarter and 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 site assessments 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 site assessments are only performed quarterly, generally representing findings on the day of the assessment. 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	Potholes near 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	Deterioration behind lime slurry piping in SDA Penthouse No. 2	August 2019	C	Conduct painting preservation measures	**Status Unchanged**	Open
5	Siding deteriorated beneath Baghouse No. 3 Hoppers	August 2019	C	Replace siding	**Status Unchanged**	Open
6	Siding on north side of Baghouse No. 2 Deteriorated	February 2020	C	Replace siding and conduct painting preservation measures	**Status Unchanged**	Open
7	Damaged/Missing insulation and lagging throughout Facility	August 2020	C	Perform audit of all steam piping and replace damaged/missing insulation and lagging throughout the Facility as needed	**Status Unchanged**	Open
8	Roof Ventilation Fan above Boiler No. 3 is not operating	November 2020	C	Repair roof ventilation fan	**Status Unchanged**	Open
9	Multiple ash hopper flap valves locked into the open position.	February 2021	B	Repair ash hopper flap valves	**Status Unchanged**	Open
10	Steam leaks (multiple at various locations) around packing and valve stems around Boiler No. 3	February 2021	C	Repair steam leaks or repack valves	During the February 2022 site visit, the only valve leaked that was observed was on a valve near Unit 3.	Open
11	Insulation and lagging damaged/deteriorated around Boiler No. 3 Steam Drum	February 2021	C	Replace insulation and lagging	**Status Unchanged**	Open
12	Baghouse No. 3 hopper heaters set to manual; heater off but signaling low temperature	February 2021	B	Repair hopper heaters	During the November 2021 site visit, it was observed that the hopper heaters were set to Auto on Units 1 and 2. Remains in manual on Unit 3 (with low temps. Indicated).	Open

Item No.	Inspection Report Deficiencies	Issue Reported	Priority*	HDR Recommendation	Status	Open / Closed
13	Feed Chute Cooling Jacket Water Level Boxes empty on Boilers No. 2 and No. 3	May 2021	B	Repair feed chute cooling jacket water level boxes	During the February 2022 site visit, the water level boxes were empty on Units 2 and 3.	Open
14	Steam leak on gland steam regulating valve on TG No. 2	May 2021	B	Repair leak on the TG No. 2 Gland Steam Regulating Valve.	During the February 2022 site visit, HDR observed that TG No. 1's gland steam valve was no longer leaking.	Open
15	Uneven water flow from Cooling Tower nozzle/distribution on southeast side of tower	August 2021	C	Repair nozzle	**Status Unchanged**	Open
16	Stair treads torn/missing on Cooling Tower Access Stairs	August 2021	A	Replace missing/damaged stair treads as needed on all steps of Cooling Tower Access Stairs	During the November 2021 site visit, HDR verified that this item is complete.	**Closed**
17	The upper level furnace camera on Unit 3 was removed. The port that the camera was installed remains open. – See Figure 1 in Appendix B.	November 2021	C	Fabricate temporary cover for open ports when cameras are out.	**Status Unchanged**	Open
18	Leak on Feedwater pipe (downstream of the feedwater pump discharge).	February 2022	A	Perform a temporary or permanent repair to the pipe to address the leak.	Added from February 2022 Site Visit.	Open
19	Overhead light on tipping floor is out.	February 2022	C	Replace light bulb.	Added from February 2022 Site Visit.	Open
20	A hole in the boiler casing was identified on the boiler left side of Unit 3 (outside the generation bank section of the boiler).	February 2022	B	The hole should be patch temporarily and a permanent repair should be made during the next outage.	Added from February 2022 Site Visit.	Open

4.0 Facility Performance

Monthly operating data provided by CAAI indicates that 86,101 tons of MSW were processed during Q2FY22, and a total of 85,086 tons of MSW including 1,541 tons of Special Handling Waste (1.8% by weight) were received. Total ash production during the quarter was 18,578 tons, which represents 21.6% of the waste processed by weight. The average uncorrected steam production rate for Q2FY22 was 3.09 $tons_{steam}/ton_{waste}$, which is higher (4.8%) than the corresponding quarter in FY21 and reflected in the increase (4.2%) in the quarterly average waste heating value (HHV) calculated by CAAI.

Chart 1: Tons of Waste Processed

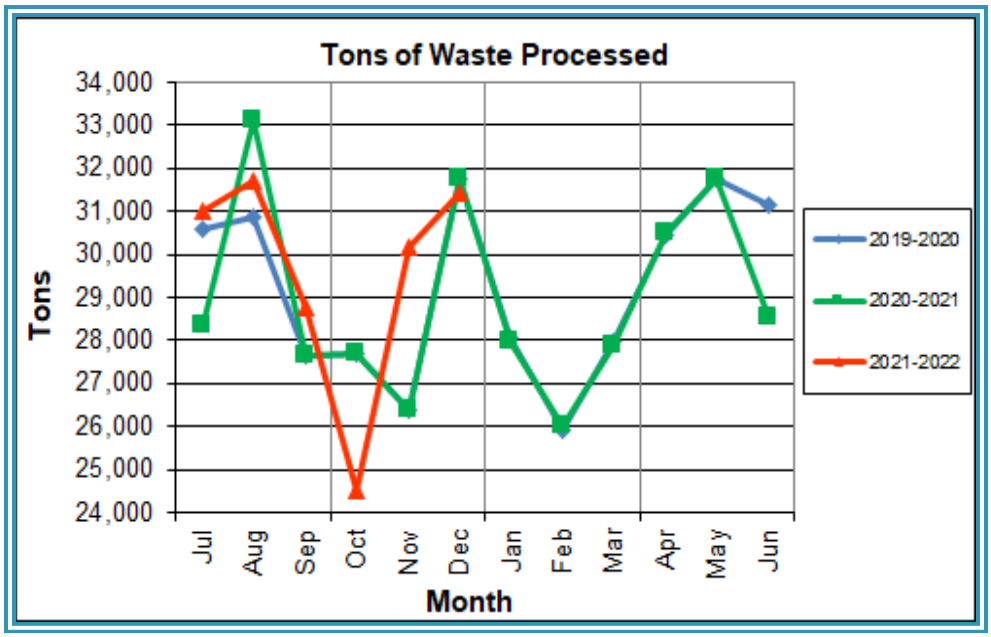


Chart 1 illustrates that Q2FY22 waste processed was higher (0.3%) than the corresponding quarter, Q2FY21. The increase occurred despite more boiler downtime (145.7 additional hours). CAAI reported that 427 tipping floor/MSW internal inspections were conducted during the quarter and three (3) notices of violation (NOV) were issued to haulers for:

- **October 2021:** Two (2) NOVs were issued for:
  - One (1) for unauthorized C&D Material (Telephone Poles)
  - One (1) for profiled waste delivered as regular MSW
- **November 2021:** One (1) NOV was issued for excessive metal in the trash

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

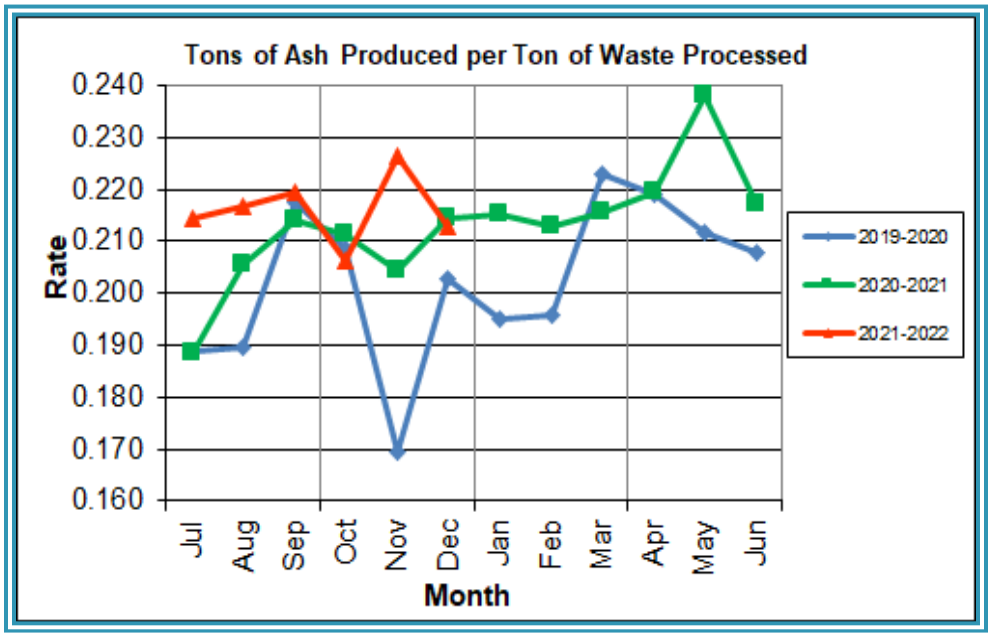


Chart 2 illustrates that the average ash production rate in Q2FY22 was higher (1.6 percentage points) at 21.6% of processed waste, compared to the corresponding quarter in FY21 when the rate was 20.0%. CAAI reports that it continues to process recovered metals through a trommel screen to remove some of the entrained ash, which is quantified and added back into the monthly ash totals.

Chart 3: Ferrous Recovery Rate

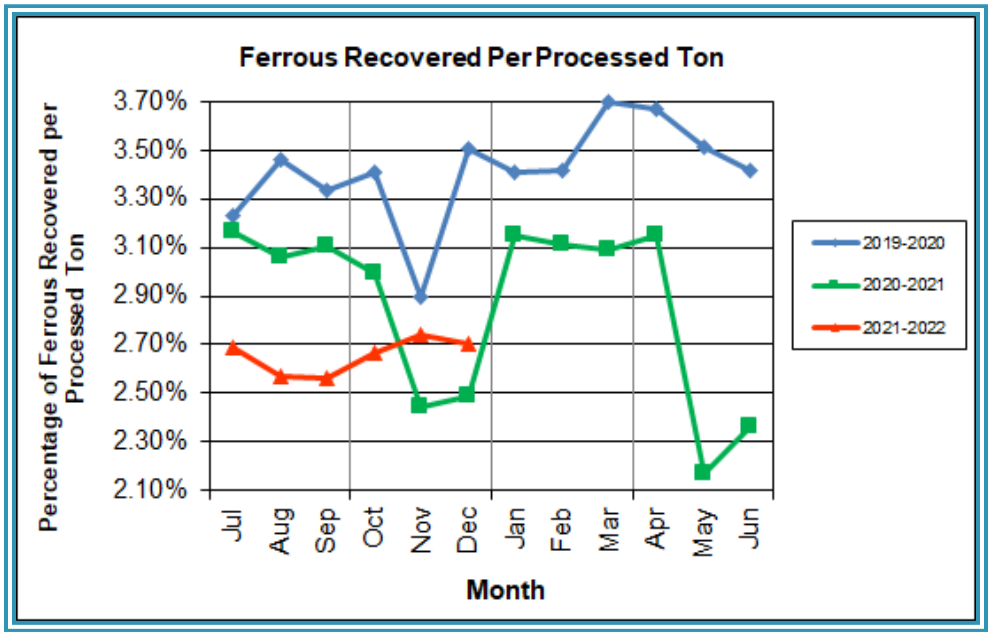
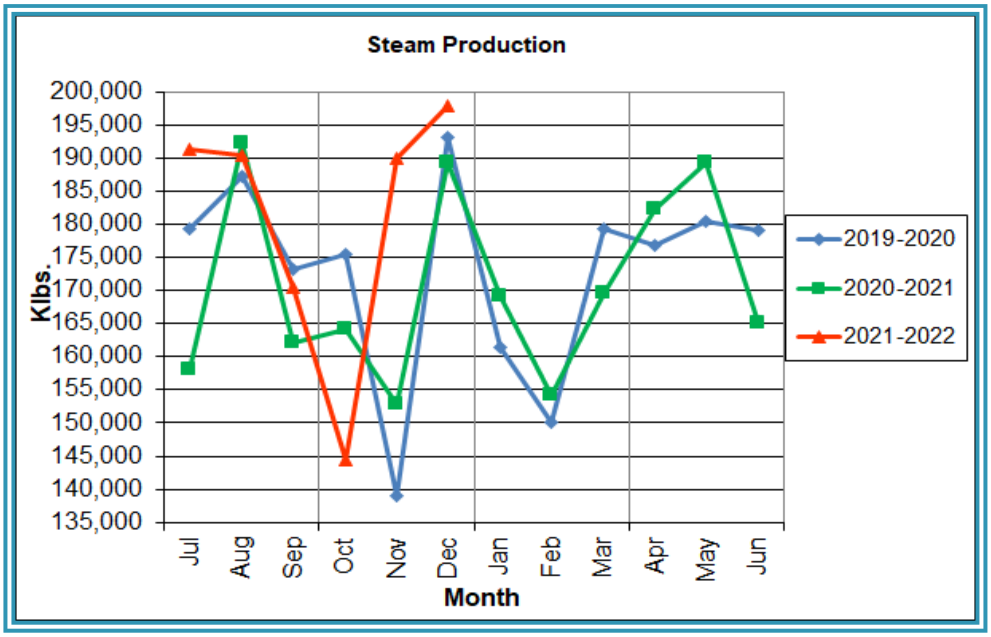


Chart 3 depicts the monthly ferrous metal recovery rate as a percentage of processed MSW tonnage. In Q2FY22, 2,329 tons of ferrous metals were recovered, which is 2.8% higher than the corresponding quarter in FY21 and equivalent to 2.7% of processed waste. As previously mentioned, the post-combustion recovered ferrous metals were processed through a trommel during the quarter to remove entrained ash, which results in a lower, but cleaner recovered metal tonnage.

Chart 4: Steam Production



In Chart 4, the total steam production for Q2FY22 was 532,337 klbs, and higher (5.2%) than the corresponding quarter in FY21. The increase in steam generation is attributable to the increase in waste heating value (4.2%), offset by more boiler downtime (145.7 additional hours).

Chart 5: 12-Month Rolling Steam Production

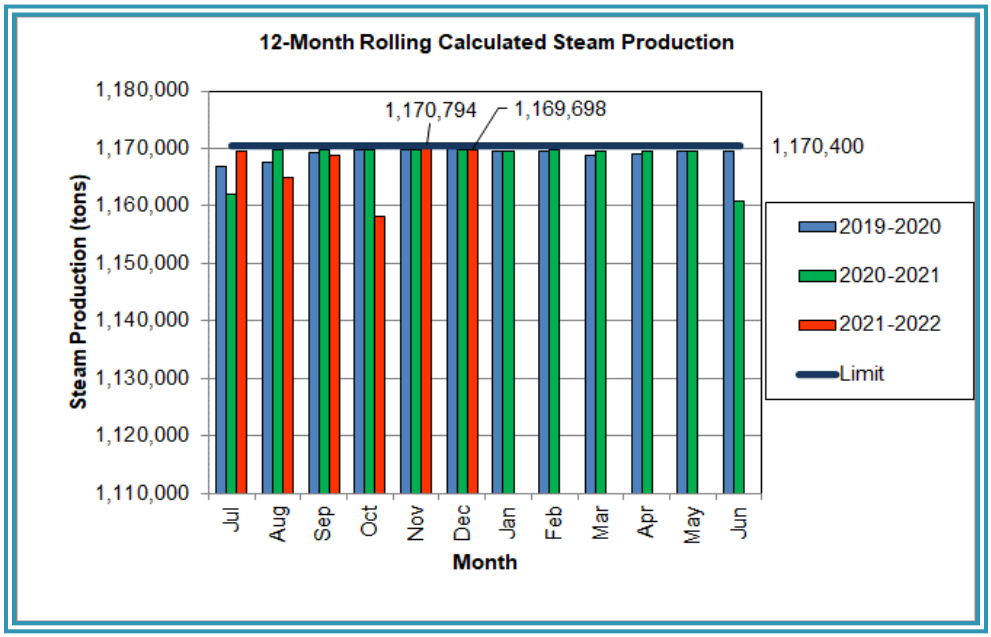
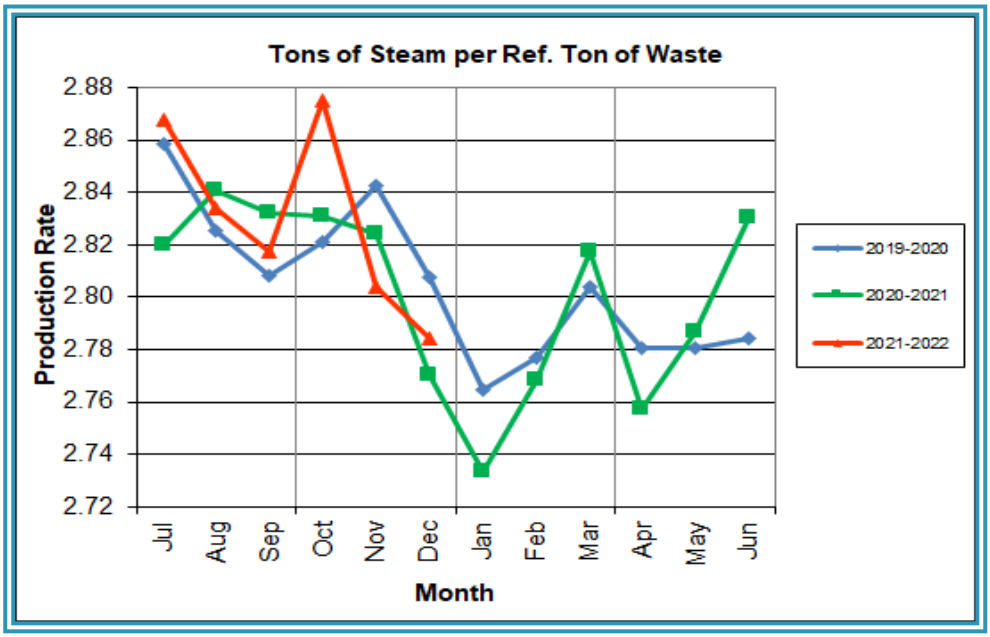


Chart 5 depicts the 12-month rolling steam production total for the quarter ending in December 2021, and for the prior two (2) fiscal years. According to the Title V permit, the annual steam production for the Facility shall not exceed 1,170,400 tons based on an average value of 3.34 lbs. of steam per lb. of MSW processed, calculated monthly as the sum of each consecutive 12-month period. During the month of November 2021, the Facility exceeded the 12-month rolling steam generation limit established in Condition 9 of the Title V Permit. The cause of the permit deviation was operator error resulting from a data entry error and under-reporting of waste received. The Facility's 12-month processing total was 350,419 tons which was 125 tons above the limit and resulted in 12-month steam production total of 1,170,789 tons, or 389 tons of steam above the permit limit. The 12-month rolling total for steam production ending in December 2021 was 1,169,698 tons which is 99.9% of the limit. Chart 5 shows that except for November 2021, the Facility throughput, and in turn, steam and electricity production are being throttled to stay slightly below the steam production permit limitation each 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 Q2FY22, this metric tracked slightly higher (0.3%) at 2.82 $tons_{steam}/ton_{ref}$ compared to the corresponding quarter in FY21. The increase in this metric indicates a slight improvement in boiler performance.

Chart 7: Calculated Waste Heating Value

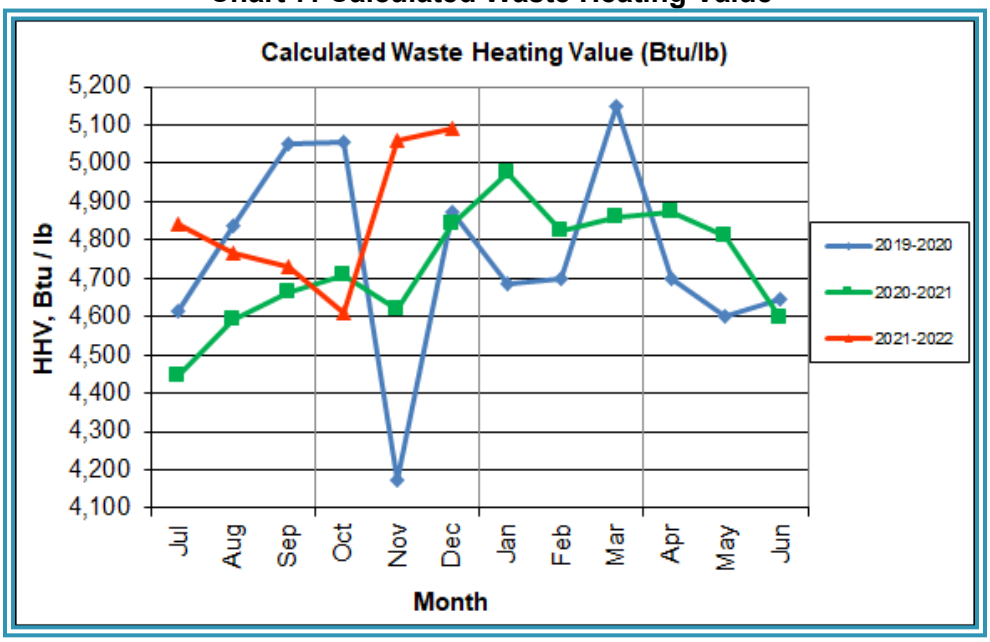


Chart 7 illustrates that Q2FY22 calculated average waste heating value was higher (4.2%) at 4,918 Btu/lb than the corresponding quarter Q2FY21, which averaged 4,722 Btu/lb. Note that 4.85[1] inches of precipitation were recorded at Ronald Reagan National Airport, which is 69.6% lower than the corresponding quarter in FY21, and positively impacted the average quarterly waste heating value.

[1] https://www.wunderground.com/

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)
Q2FY20	**Quarterly Totals**	**85,836**	**0**	**16,689**	**3,824**	**2,820**	**507,778**	**34,298**
	October -19	27,685	0	5,780	1,340	944	175,493	12,155
	November -19	26,393	0	4,468	1,238	764	139,112	8,187
	December - 19	31,758	0	6,441	1,246	1,112	193,173	13,956
Q2FY21	**Quarterly Totals**	**85,827**	**0**	**18,052**	**2,834**	**2,265**	**506,239**	**35,289**
	October - 20	27,695	0	5,858	1,045	829	164,131	11,300
	November - 20	26,378	0	5,391	930	645	152,871	10,355
	December - 20	31,754	0	6,803	859	791	189,237	13,634
Q2FY22	**Quarterly Totals**	**86,101**	**0**	**18,578**	**1,541**	2,329	**532,337**	**37,216**
	October - 21	24,531	0	5,062	511	654	144,448	9,342
	November - 21	30,144	0	6,831	533	826	189,992	13,569
	December - 21	31,426	0	6,685	497	849	197,897	14,305
FY22 YTD Totals		**177,586**	**0**	**38,423**	**3,486**	**4,714**	**1,084,445**	**74,816**
FY21 Totals		**347,556**	**0**	**74,135**	**10,116**	**9,908**	**2,048,011**	**142,476**
FY20 Totals		**350,147**	**0**	**70,964**	**13,226**	**11,966**	**2,074,819**	**143,282**

Table 2 presents the production data provided to HDR by CAAI for Q2FY22 on both a monthly and quarterly basis. For purposes of comparison, data for Q2FY20 and Q2FY21 are also shown, as well as FY20, FY21 and FY22 year to date (YTD) totals.

In comparing quarterly totals, the data shows:

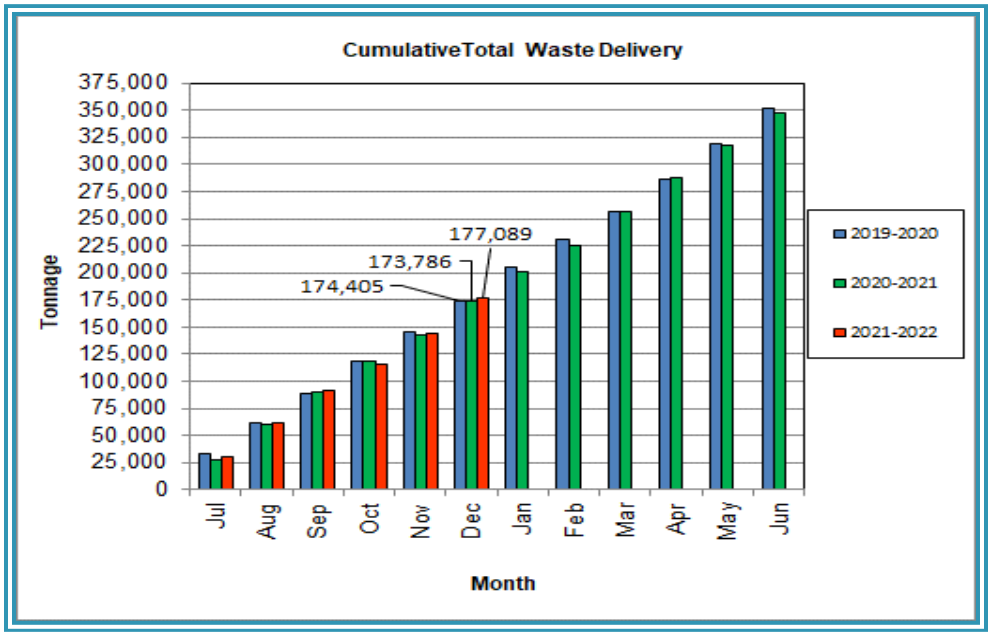
- More waste was processed in Q2FY22 than Q2FY21 and Q2FY20
- More steam was generated in Q2FY22 than Q2FY21 and Q2FY20
- More electricity (net) was generated in Q2FY22 than Q2FY21 and Q2FY20
- Less supplemental waste was received in Q2FY22 than Q2FY21 and Q2FY20

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 an annual rolling average, evaluated monthly.

Table 3: Waste Delivery Classification

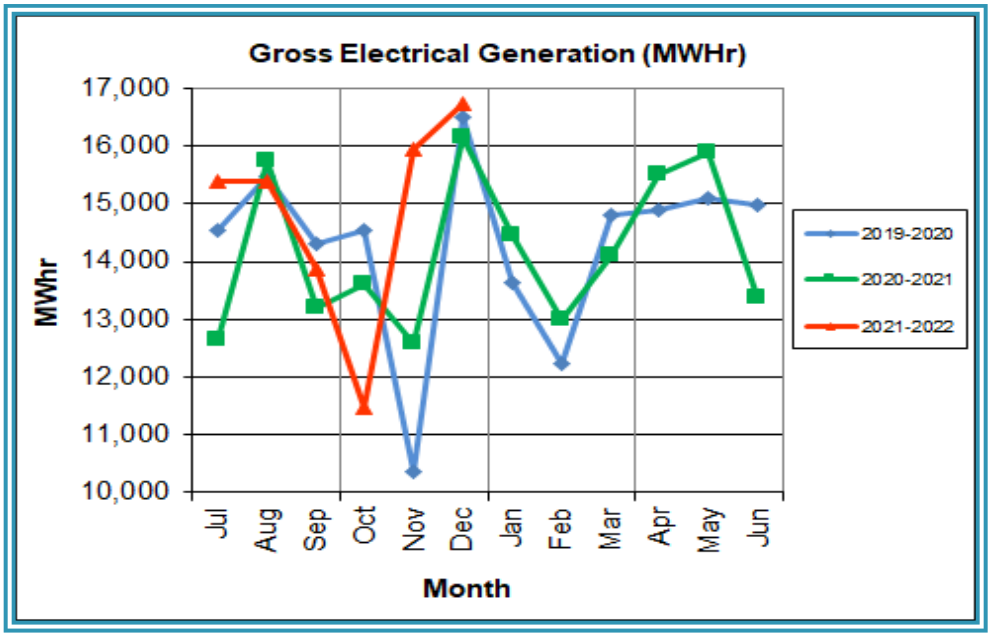
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Totals	% of Total
FY18	City Waste	1,699	1,876	1,642	1,719	1,849	1,541	1,621	1,365	1,569	2,000	2,298	2,011	21,191	6.03%
	County Waste	2,458	2,654	2,513	2,529	2,635	2,321	2,502	2,110	2,391	2,509	2,959	2,776	30,356	8.63%
	Municipal Solid Waste	24,950	25,303	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**	**351,693**	**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	1,870	1,489	1,925	1,931	1,849	2,051	22,160	6.30%
	County Waste	3,069	2,600	2,544	2,664	2,507	2,575	2,694	2,195	2,509	2,518	2,663	2,861	31,399	8.93%
	Brokered Waste	-	-	-	-	-	-	120	114	67	58	-	-	359	0.10%
	Municipal Solid Waste	26,033	23,287	22,129	23,644	20,837	23,822	24,859	20,472	20,333	24,220	27,605	27,375	284,614	80.91%
	Supplemental Waste	1,269	1,321	1,236	1,340	1,238	1,246	1,239	1,102	1,106	582	627	920	13,226	3.76%
	MSW Totals	**32,440**	**28,979**	**27,634**	**29,541**	**26,324**	**29,487**	**30,781**	**25,371**	**25,939**	**29,309**	**32,745**	**33,207**	**351,757**	**100.00%**
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Totals	% of Total
FY21	City Waste	1,583	1,905	2,121	1,906	1,970	1,999	1,556	1,393	2,038	2,102	2,042	2,197	22,811	6.55%
	County Waste	2,377	2,713	2,711	2,589	2,550	2,646	2,365	2,054	2,441	2,472	2,542	2,682	30,143	8.66%
	Municipal Solid Waste	22,517	26,941	24,523	22,102	19,209	25,831	22,419	20,046	25,980	25,621	25,260	24,603	285,053	81.88%
	Supplemental Waste	691	1,139	927	1,045	930	859	895	1,070	747	653	519	641	10,117	2.91%
	MSW Totals	**27,169**	**32,698**	**30,282**	**27,642**	**24,659**	**31,336**	**27,234**	**24,562**	**31,207**	**30,848**	**30,363**	**30,123**	**348,124**	**100.00%**
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Totals	% of Total
FY22	City Waste	1,853	2,080	2,042	1,855	2,002	1,914							11,746	6.63%
	County Waste	2,516	2,403	2,457	2,184	2,463	2,489							14,513	8.20%
	Municipal Solid Waste	24,682	26,646	25,378	19,376	23,834	27,424							147,340	83.20%
	Supplemental Waste	688	778	479	514	534	499							3,492	1.97%
	MSW Totals	**29,740**	**31,907**	**30,356**	**23,929**	**28,832**	**32,326**							**177,090**	**100.00%**

Chart 8: Cumulative Total Waste Delivery



As depicted in Table 3 and Chart 8, through Q2FY22, cumulative total waste delivery was 1.9% higher compared to Q2FY21.

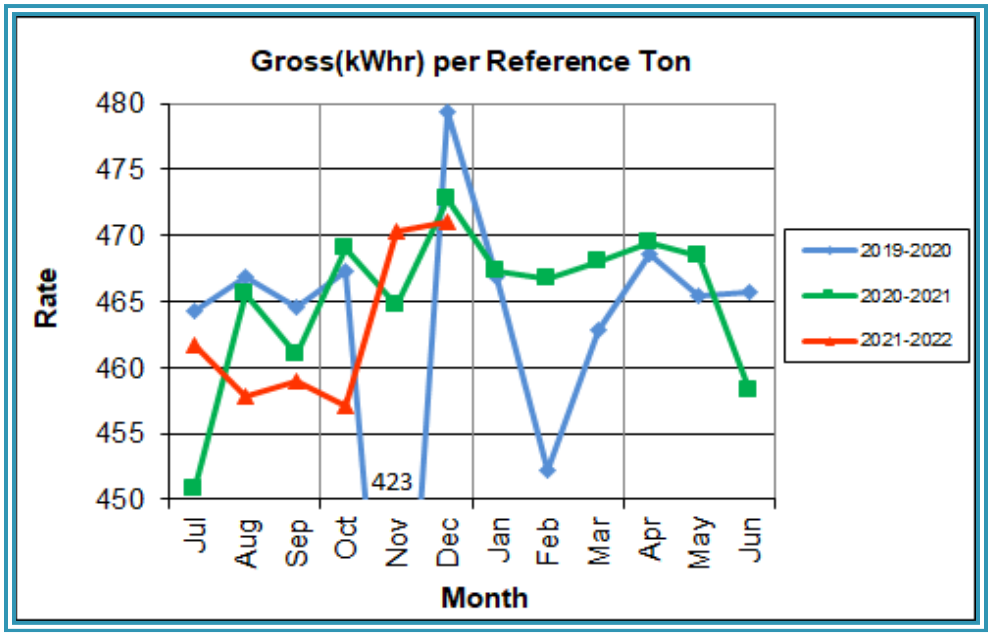
Chart 9: Gross Electrical Generation



During Q2FY22, the Facility generated 44,160 MWhrs (gross) of electricity compared to Q2FY21 generation of 42,317 MWhrs (gross), a 4.4% increase. The increase in electricity generated (gross) in Q2FY22 is attributable to higher (5.2%)

steam production and less turbine generator downtime (22.6 fewer hours). Note that the sharp spikes depicted in Chart Nos. 9 through 13 for November 2019 are a result of significant downtime (635.0 hours) experienced by Turbine Generator No. 1 for a 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 Q2FY22 was 466 kWhr, which is slightly lower (0.6%) than the corresponding quarter in FY21. 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

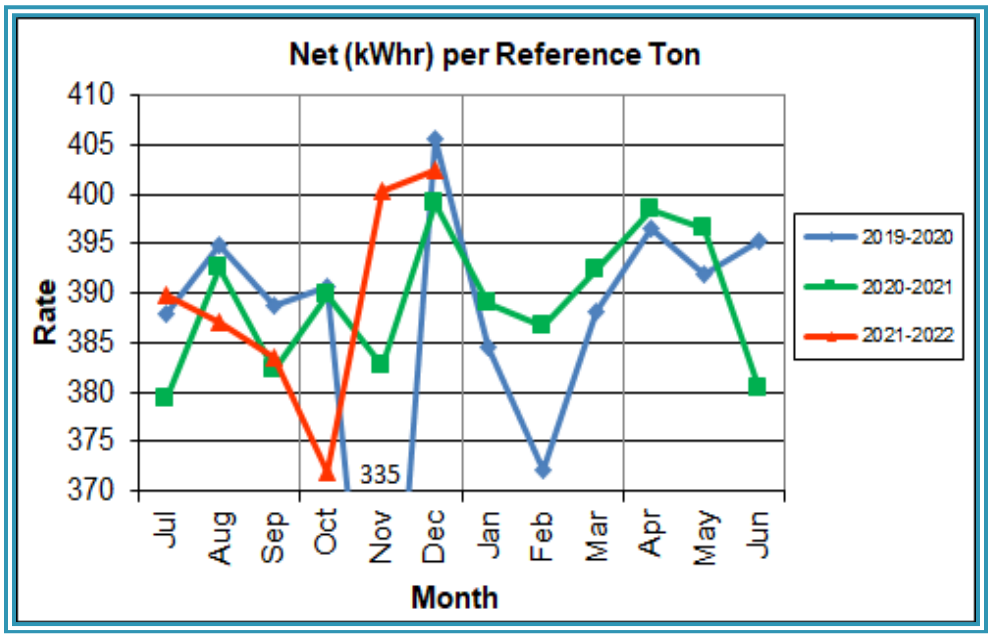


Chart 11 depicts the normalized net power (gross minus in-house usage) generation history. In Q2FY22, the average net electrical generation per reference ton was 392 kWhr, which is 0.3% higher than the corresponding quarter in FY21.

Chart 12: Net Conversion Rate

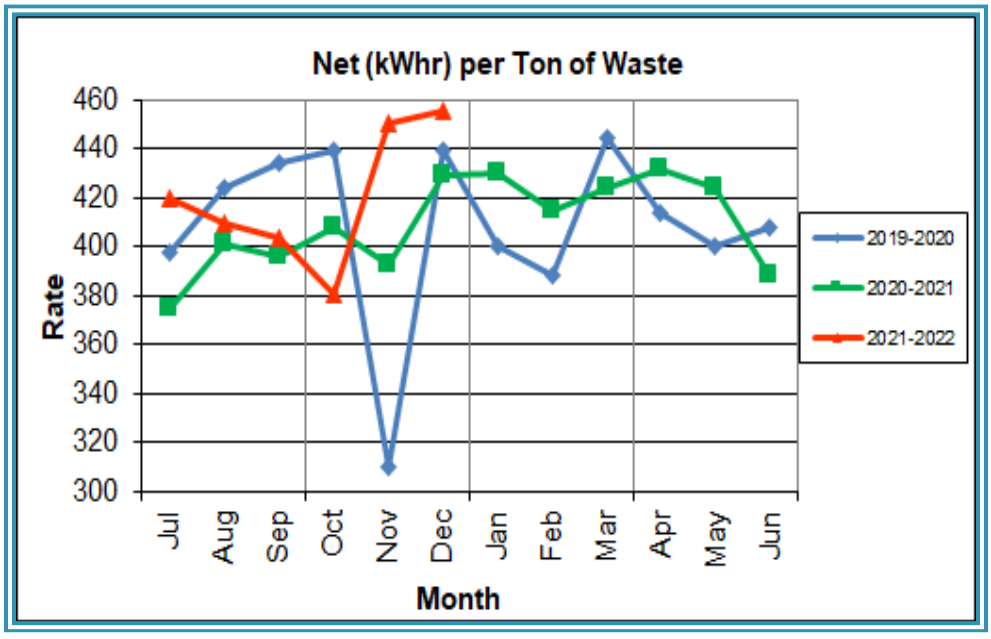


Chart 12 depicts the net power generation per processed ton. The net electrical generation per processed ton in Q2FY22 was 429 kWhr, which is 4.6% higher than the corresponding quarter.

Chart 13: Gross Turbine Generator Conversion Rate

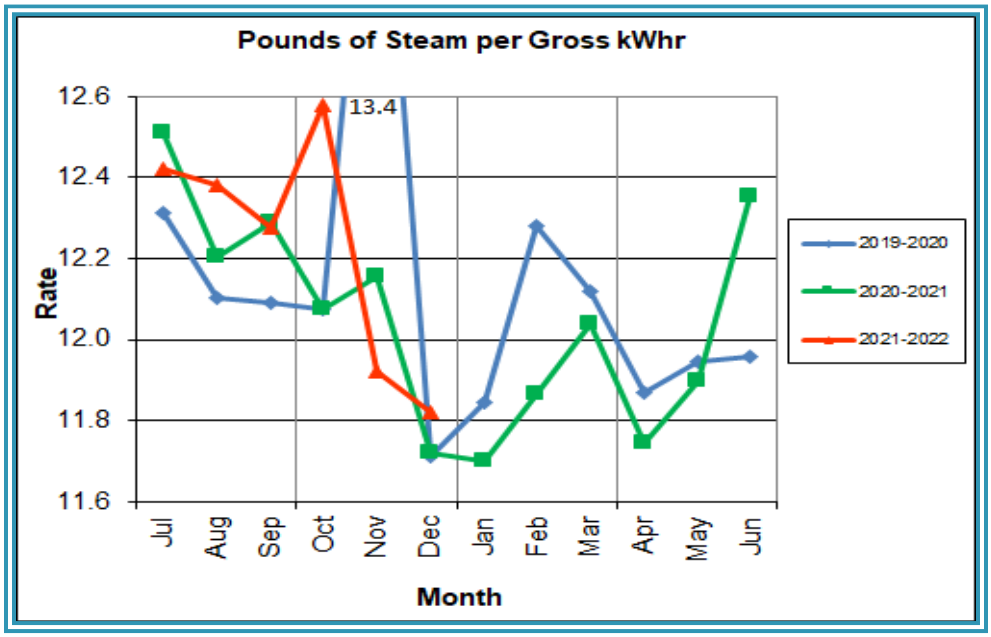


Chart 13 illustrates the quantities of steam required to generate one (1) kWhr of electricity. This measure is a turbine generator performance indicator, where lower steam rates indicate superior performance. For simplification, this calculated rate is based on the average for the two turbine generators. In Q2FY22 the average pounds of steam consumed per gross kWhr generated was 12.1, which is 0.8% higher (less efficient) than the corresponding quarter Q2FY21. A factor that negatively impacts this metric is Turbine Generator No. 2 continues to operate with its Stage 9 blades removed from the rotor[2]. Another factor is the diversion of steam to heat under-grate air to improve the combustion of low Btu (wet) fuel. This steam diversion decreases power generation. The average main steam temperature during the quarter was 674.0°F, which is 6.7°F higher than the average main steam temperature of the corresponding quarter last fiscal year and 26.0°F lower than design temperature of 700°F. Lower main steam temperature decreases power generation, all other factors being equal.

[2] 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.

4.1 Utility and Reagent Consumptions

Table 4: Facility Utility and Reagent Consumptions

Utility	Units	Q2FY22 Total	Q2FY21 Total	Q2FY22"Per Processed Ton" Consumption	Q2FY21"Per Processed Ton" Consumption	FY22 YTD Total
Purchased Power	MWhr	5,418	5,493	0.0629	0.0640	10,914
Fuel Oil	Gal.	10,670	9,660	0.12	0.11	23,050
Boiler Make-up	Gal.	1,085,000	1,099,000	12.60	12.80	2,543,000
Cooling Tower Make-up	Gal.	36,334,716	32,937,463	422.00	383.77	83,195,715
Pebble Lime	Lbs.	1,608,000	1,596,000	18.68	18.60	3,274,000
Ammonia	Lbs.	188,000	164,000	2.18	1.91	393,000
Carbon	Lbs.	78,000	78,000	0.91	0.91	156,000

Fuel oil usage during the quarter represents approximately 0.19% of the total heat input to the boilers, which compares favorably with industry averages, and is slightly higher than the 0.17% of total heat input in Q2FY21. 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 1.7% of steam flow, which is slightly lower than the boiler makeup in Q2FY21 which was 1.8% of steam flow. Higher boiler makeup quantities are indicative of increased steam leakage, and the improvement in this metric indicates that the substantial leaks have been corrected. Pebble lime usage, at 1,608,000 lbs. is higher (0.8%) than the corresponding quarter last year.

In comparing Q2FY22 to Q2FY21 on a per processed ton consumption basis:

- the purchased power consumption rate was 1.7% lower
- the total fuel oil consumption rate was 10.1% higher
- the boiler make-up water consumption rate was 1.6% lower
- the cooling tower make-up water consumption rate was 10.0% higher
- the total pebble lime consumption rate was 0.4% higher
- the ammonia consumption rate was 14.3% higher
- the carbon consumption rate was 0.3% lower

4.2 Safety & Environmental Training

The Facility experienced no OSHA recordable accidents and no First Aid Accidents during Q2FY22. CAAI has operated 1,376 days without an OSHA recordable

accident as of December 31, 2021. Safety and Environmental training were conducted during the quarter with themes as follows:

October 2021

- Safety:
  - Blood Borne Pathogens
  - First Aid Medical Emergencies
  - Medical Surveillance
  - Ergonomics and Brute Force
  - What If? Next Injury
- Environmental: No environmental themes were provided by CAAI

November 2021

- Safety:
  - Active Shooter/Civil Disturbance
  - Severe Weather
  - Emergency Action Plan (EAP)
  - Evacuation Drill
- Environmental:
  - Odor Control
  - Refuse Pit Management
  - United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) Waste Training for processing of International Waste

December 2021

- Safety:
  - Hearing Conservation
  - Line of Fire
  - Hand and Finger Injuries
  - Housekeeping
- 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 2, 2021, Boiler No. 1 experienced 167.4 hours of downtime for a scheduled boiler outage. Beginning on October 18, 2021, Boiler No. 2 experienced 28.3 hours of downtime for a scheduled cleaning outage. Some significant maintenance items completed during the Boiler No. 1 Major outage are:

- Installation of upgraded sootblower lances in the generating bank for testing purposes
- Installation of new style baffle plates at the 4th floor elevation on the inlet and outlet sides of the generating bank
- Replacement of both drum and superheater safeties
- Replacement of the coupling on the Over Fire Air Fan and realignment of all fans
- Repair of leaks on the feed chute
- Replacement of one (1) feed table bar and two (2) slide shoes
- Installation of new Particulate Matter (PM) detectors on the baghouse outlet duct
- Repair of a hole in the side of the feed hopper
- Replacement of cages and bags on all six (6) baghouse cells
- Repairs to the baghouse hoppers and cells
- Installation of lockable handles for the new ammonia stations

In addition to the scheduled outages, CAAI reports that 1,186 preventative maintenance actions were completed during the quarter.

5.1 Availability

Facility availabilities for Q2FY22 are shown in Table 5. According to CAAI reports, the average unit availabilities for Boiler Nos. 1, 2, and 3 for Q2FY22 were 97.7%, 100.0%, and 100.0%, respectively. The three-boiler average availability during the quarter was 99.2%, which is excellent. Note that the boilers experienced two (2) instances of standby time during the quarter totaling 284.7 hours that did not factor into overall availability.

According to CAAI reports, the average unit availabilities for Turbine Generator Nos. 1 and 2 for Q2FY22 were 100.0%. Note that the turbine generators experienced two (2) instances of standby time during the quarter totaling 50.9 hours that did not factor into overall availability.

Table 5: Quarterly Facility Unit Availabilities

Availability	Q1FY22 Average	Q2FY22 Average	FY22 YTD Average
Boiler No. 1	97.6%	97.7%	97.6%
Boiler No. 2	98.8%	100.0%	99.3%
Boiler No. 3	98.7%	100.0%	99.2%
Avg.	***98.4%***	***99.2%***	***98.7%***
Turbine No. 1	100.0%	100.0%	100.0%
Turbine No. 2	100.0%	100.0%	100.0%
Avg.	***100.0%***	***100.0%***	***100.0%***

Table 6: Boiler Downtime – Q2FY22

Boiler Number	Outage Begin Date	Outage End Date	Hours Unavailable	Downtime Classification	Reason Unavailable
1	10/2/21	10/9/21	167.4	Scheduled	Scheduled Major Outage
2	10/2/21	10/2/21	15.8	Unscheduled	Grate Bar Repairs
2	10/18/21	10/19/21	28.3	Scheduled	Scheduled Cleaning Outage
2	10/20/21	10/22/21	72.0	Standby	Permit Process Limitations
3	10/23/21	11/1/21	212.7	Standby	Permit Process Limitations
1	11/3/21	11/5/21	33.9	Unscheduled	Economizer tube repair and auxiliary burner electrical issues
Total Unscheduled Downtime				**49.7 Hours**	
Total Scheduled Downtime				**195.7 Hours**	
Total Standby Downtime				**284.7 Hours**	
Total Downtime				**530.1 Hours**	

Table 7: Turbine Generator Downtime – Q2FY22

Turbine Generator Number	Outage Begin Date	Outage End Date	Hours Unavailable	Downtime Classification	Reason Unavailable
1	10/6/21	10/7/21	37.4	Standby	Lack of Steam due to Boiler Permit Process Limitations
2	10/21/21	10/21/21	13.5	Standby	Lack of Steam due to Boiler Permit Process Limitations
Total Unscheduled Downtime				**0.0 Hours**	
Total Scheduled Downtime				**0.0 Hours**	
Total Standby Downtime				**50.9 Hours**	
Total Downtime				**50.9 Hours**	

5.2 Facility Housekeeping

CAAI is performing Facility housekeeping and maintaining plant cleanliness in accordance with acceptable industry practices. A site walkdown was conducted in November 2021. At the time of the walkdown, new deficiencies were recorded, and prior deficiencies were given a status update. Photos of interest from the walkdown are depicted in Appendix B. The Facility housekeeping ratings from the November 2021 walkdown are presented in Table 8.

Table 8: Facility Housekeeping Ratings – November 2021

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 Q2FY22 are summarized in Appendix A. CAAI reported that the Facility experienced one (1) permit deviation during Q2FY22. As previously described, during the month of November 2021, the Facility exceeded the 12-month rolling steam generation limit established in Condition 9 of the Title V Permit. The cause of the permit deviation was operator error resulting from a data entry error and under-reporting of waste received. The Facility's 12-month processing total was 350,419 tons which was 125 tons above the limit and resulted in 12-month steam production total of 1,170,789 tons, or 389 tons of steam above the permit limit. As of December 31, 2021, the Facility operated 31 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. LN™ Technology has been installed on Boiler Nos. 1 and 2, with Boiler No. 1 operating under the lower NOx limits of 110 ppm (24 hr) and 90 ppm (annual rolling average) since June 2021, and Boiler No. 2 since June 2020. In December 2021 CAAI provided VADEQ a notification letter that the Boiler No. 3 LN™ Technology retrofit was underway. As was the case with the LN™ Technology installations on Boiler Nos. 1 and 2, Boiler No. 3 will undergo a period of calibration and optimization and is expected to be operating under the lower NOx limits of 110 ppm (24 hr. average) and 90 ppm (annual rolling average) by June 2022.

6.2 Nitrogen Oxide Emissions

During Q2FY22, the monthly emission concentrations of nitrogen oxides (NO_x) averaged 89.0 ppmdv, 85.0 ppmdv, and 158.7 ppmdv for Boiler Nos. 1, 2, and 3, respectively. As previously mentioned, the LN™ Technology has been fully

implemented on Boiler Nos. 1 and 2 and its installation underway on Boiler No. 3 as of the end of Q2FY22. In comparing Q2FY22 to the corresponding quarter last year, ammonia usage increased 14.6% while Boiler Nos. 1 and 2 operated at 50% NOx reduction.

6.3 Sulfur Dioxide Emissions

During Q2FY22 the monthly emission concentration of stack sulfur dioxide (SO_2) averaged 1.3 ppmdv, 3.7 ppmdv, and 0.3 ppmdv for Boiler Nos. 1, 2, and 3, respectively. All these stack SO_2 concentrations are significantly below the permit limit of 29 ppmdv @ 7% O_2.

6.4 Carbon Monoxide Emissions

During Q2FY22, the monthly average CO emission concentrations on Boiler Nos. 1, 2, and 3 were 34.3 ppmdv, 29.3 ppmdv, and 20.3 ppmdv, respectively, and all are well within permit limits (100 ppmdv, 4-hour average).

6.5 Opacity

During Q2FY22, the average opacity on Boiler Nos. 1, 2, and 3 were 1.0%, 0.9%, and 0.9%, respectively, which are all significantly below the 10% (6-minute) average permit limit.

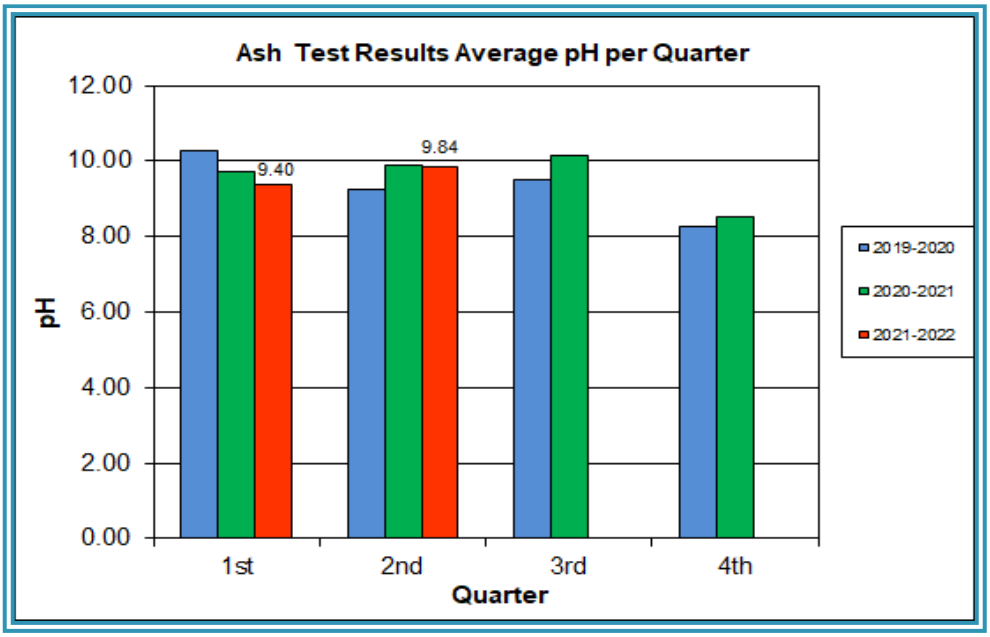
6.6 Daily Emissions Data

Appendix A, Tables 9, 10, and 11 tabulate the monthly average, maximum, and minimum emissions data for each unit during Q2FY22. 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 Q4FY19, CAAI reported that it was discontinuing dolomitic lime feed, while increasing lime slurry feed 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 the quarter. CAAI also samples ash monthly in-house, and documents pH reading to adjust 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 Q2FY22, the average ash pH for in-house tests was 9.8.

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 - 21	AVG	82.7	57.0	1.0	31.0	89.0	1.1	299.0	12.3	3.7
	Max	88.1	99.0	3.0	41.0	92.0	1.3	300.0	12.6	4.4
	Min	71.5	36.0	0.0	23.0	85.0	0.7	299.0	12.2	3.0
Nov - 21	AVG	88.3	35.0	1.0	38.0	89.0	1.3	299.0	12.2	3.7
	Max	90.9	42.0	2.0	50.0	90.0	1.6	299.0	12.3	4.0
	Min	84.2	20.0	0.0	31.0	88.0	1.1	299.0	12.2	3.4
Dec - 21	AVG	87.7	31.0	2.0	34.0	89.0	0.5	299.0	12.2	3.6
	Max	91.5	50.0	3.0	42.0	90.0	1.4	299.0	12.3	3.8
	Min	84.7	20.0	0.0	25.0	88.0	0.0	299.0	12.2	2.8
Quarter Average		86.2	0.0	1.3	34.3	89.0	1.0	299.0	12.2	3.7
Quarter Max Value		91.5	99.0	3.0	50.0	92.0	1.6	300.0	12.6	4.4
Quarter Min Value		71.5	20.0	0.0	23.0	85.0	0.0	299.0	12.2	2.8
Limits:		99	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 - 21	AVG	83.1	49.0	4.0	26.0	85.0	0.9	299.0	12.3	3.7
	Max	88.7	74.0	7.0	37.0	86.0	1.0	301.0	12.6	4.1
	Min	71.5	25.0	1.0	18.0	82.0	0.7	297.0	12.3	3.0
Nov - 21	AVG	89.6	43.0	4.0	31.0	85.0	1.2	301.0	12.3	2.9
	Max	92.4	54.0	7.0	47.0	86.0	1.6	305.0	12.5	3.8
	Min	85.3	30.0	1.0	18.0	84.0	0.9	300.0	12.2	2.2
Dec - 21	AVG	89.1	34.0	3.0	31.0	85.0	0.5	300.0	12.3	2.6
	Max	92.0	53.0	6.0	43.0	86.0	1.3	301.0	12.4	2.8
	Min	86.2	23.0	1.0	17.0	85.0	0.0	300.0	12.2	2.0
Quarter Average		87.3	42.0	3.7	29.3	85.0	0.9	300.0	12.3	3.1
Quarter Max Value		92.4	74.0	7.0	47.0	86.0	1.6	305.0	12.6	4.1
Quarter Min Value		71.5	23.0	1.0	17.0	82.0	0.0	297.0	12.2	2.0
Limits:		98	NA	29	100	110	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 - 21	AVG	82.4	47.0	0.0	18.0	159.0	0.8	298.0	12.4	3.7
	Max	89.6	83.0	2.0	34.0	160.0	1.0	299.0	12.6	4.1
	Min	71.6	28.0	0.0	1.0	158.0	0.6	294.0	12.2	3.0
Nov - 21	AVG	88.8	27.0	0.0	16.0	159.0	1.0	298.0	12.3	3.8
	Max	92.2	38.0	1.0	41.0	161.0	1.2	298.0	12.6	4.1
	Min	78.5	18.0	0.0	4.0	158.0	0.7	298.0	12.2	2.9
Dec - 21	AVG	88.5	26.0	1.0	27.0	158.0	0.9	298.0	12.3	3.7
	Max	91.4	42.0	4.0	38.0	160.0	1.3	299.0	12.3	3.9
	Min	84.4	19.0	0.0	17.0	157.0	0.5	297.0	12.2	2.9
Quarter Average		86.6	33.3	0.3	20.3	158.7	0.9	298.0	12.3	3.7
Quarter Max Value		92.2	83.0	4.0	41.0	161.0	1.3	299.0	12.6	4.1
Quarter Min Value		71.6	18.0	0.0	1.0	157.0	0.5	294.0	12.2	2.9
Limits:		98	NA	29	100	205	10	329	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.

APPENDIX B
SITE PHOTOS – NOVEMBER 2021

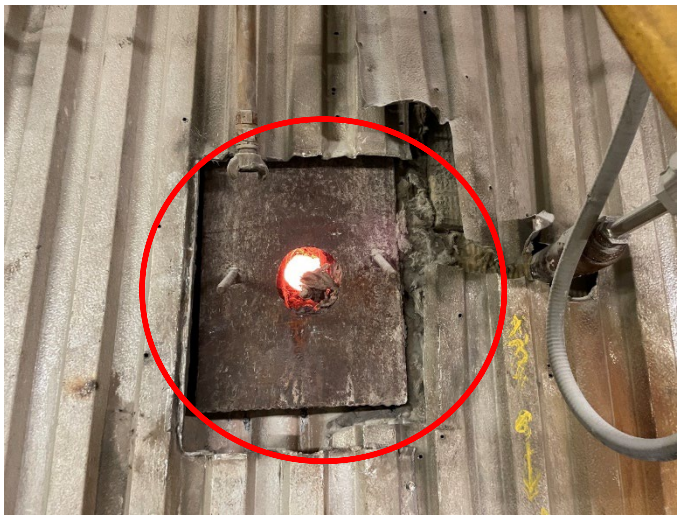


Figure 1: The upper level furnace camera on Unit 3 was removed. The port that the camera was installed remains open. – New Deficiency

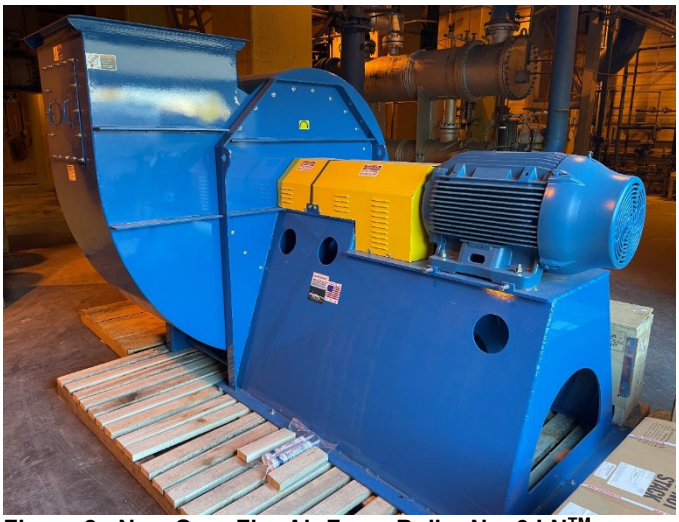


Figure 2: New Over Fire Air Fan – Boiler No. 3 LN™ Technology Installation

Figure 3: Firing Aisle

Figure 4: New Particulate Matter (PM) Monitors

Figure 5: Ferrous Drum Magnet

Figure 6: Refuse Pit