Puite, Tammie (EGLE)

From: Howe, Jeremy (EGLE)
Sent: Friday, August 20, 2021 3:24 PM
To: Puite, Tammie (EGLE)
Subject: FW: Grayling Generating Station, LP - VN Second Response
Attachments: GGS_VN_FLOW CEMS_August_SubmittalwAttachments_Appedicies_Signature.pdf

Please post to the web on Monday.

Jeremy Howe
Environmental Quality Analyst
Air Quality Division / Cadillac District Office
Michigan Department of Environment, Great Lakes, and Energy
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Follow Us | **Michigan.gov/EGLE**

From: KATHRYN M. CUNNINGHAM <KATHRYN.CUNNINGHAM@cmsenergy.com>
Sent: Friday, August 20, 2021 1:52 PM
To: Howe, Jeremy (EGLE) <HoweJ1@michigan.gov>; Camilleri, Jenine (EGLE) <CamilleriJ@michigan.gov>; Kajiya-Mills, Karen (EGLE) <KAJIYA-MILLSK@michigan.gov>; Nixon, Shane (EGLE) <NIXONS@michigan.gov>; Radulski, Rebbecca (EGLE) <RADULSKIR@michigan.gov>; Frushour, Charles <Frushour.Charles@epa.gov>; Nichols, Louis <Nichols.Louis@epa.gov>; Dolehanty, Mary Ann (EGLE) <DOLEHANTYM@michigan.gov>
Cc: Edward A. Going <Edward.Going@cmsenergy.com>; Scott Sinkwitts <scott.sinkwitts@cmsenergy.com>; Collins Paul <collinsp@millercanfield.com>; Neil G. Pansey <Neil.Pansey@cmsenergy.com>; Linda M. Hilbert <linda.hilbert@cmsenergy.com>; Richard D. Laur <Richard.Laur@cmsenergy.com>; Dustin J. Miller <DUSTIN.MILLER@cmsenergy.com>
Subject: Grayling Generating Station, LP - VN Second Response

Good Afternoon,
Please find attached the second response to the Violation Notice issued on June 18, 2021. We have also included EPA on this email as they were involved with a call on August 5 where they requested information regarding flow probe location. A hard copy has been sent to Jeremy Howe and Jenine Camilleri. Please contact Mr. Ed Going or myself with any questions.

Kathryn Cunningham, P.E.
CMS Enterprises Environmental Support
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Parnall Office, P22-534

Grayling Generating Station
"Providing Clean Renewable Energy Through Biomass Generation."

4400 West Four Mile Road
Grayling, Michigan 49738
(989) 348-4575

August 20, 2021

Mr. Jeremy Howe
Environmental Air Quality Analyst
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Ms. Jenine Camilleri
Enforcement Unit Supervisor
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Lansing, Michigan 48909-7760.

Via e-mail (howej1@Michigan.gov, camillerij@Michigan.gov) and UPS

RE: Response to Violation Notices issued June 18, 2021 and July 28, 2021
Grayling Generating Station Limited Partnership [SRN: N2388]
Failure to Continuously Monitor Emissions Utilizing Flow CEMS

Dear Mr. Howe:

Grayling Generating Station, LP (GGS) provides this supplemental response to the Violation Notice (VN) issued by Michigan Department of Environment, Great Lakes, and Energy (EGLE) on June 18, 2021 and subsequent Second Violation Notice on July 28, 2021. GGS attaches and incorporates by reference its July 21, 2021 response to the first VN as Attachment 1.

The EGLE VN is premised upon anomalous data, particularly with respect to significantly different measured exhaust flows resulting from the use of two different EPA reference methods[1] during roughly concurrent periods in November 2020. After extensive analysis and investigation, GGS and its supporting staff have identified several phenomena that may have contributed to the anomaly but have been unable to identify a definitive cause. Details of the analyses completed to date are contained in a Technical Memorandum included as Attachment 2. As will be discussed in the remainder of this response, GGS has ensured the quality of flow Continuous Emission Monitoring Systems (CEMS) data by performing a new Relative Accuracy Test Audit (RATA), using a different contractor in April and May 2021 and by researching and verifying assumptions about its monitoring technology. Given the express detailed guidance for these actions provided

[1] The Renewable Operating Permit (ROP) emissions testing exhaust flow data was gathered using EPA Reference Methods 5, 8 and 23, and the CEMS exhaust flow monitor was checked during the RATA using EPA Reference Method 2.

in 40 CFR Part 75, GGS believes that these measures should instill confidence in the facility's current and future CEMS data.

This response is presented in two parts, this letter, and the attached technical memorandum. The letter provides the factual background concerning the events that culminated in the EGLE VN and then responds to each specific allegation of violation. The technical memorandum presents the results of GGS and its supporting staff's technical investigations into possible causes of the data anomaly cited in the EGLE VN and the efforts to ensure that CEMS flow monitor records quality data moving forward.

Background

In November 2020, following an extended plant outage, GGS conducted a RATA of the biomass boiler's CEMS roughly concurrent with conducting emissions testing required by the plant's ROP for various air pollutants that are not monitored via CEMS. GGS contracted with QSTI and AETB certified Network Environmental Services, Inc. ("Network") to perform the CEMS RATA and ROP emissions testing. Both the CEMS RATA and emissions testing were observed by EGLE representatives. Although it appeared that the boiler CEMS had passed the RATA, EGLE later informed GGS that it would not accept the November 2020 flow CEMS RATA results because it had compared the flow monitor RATA results with a flow monitor "RATA-like" comparison using results from the emissions testing and determined that the results were incongruous.

GGS first learned that EGLE questioned the November 2020 flow RATA test some three months later through email correspondence dated February 5, 2021. The email presented a comparison of stack flow Reference Method (RM) 5, 8 and 23 data vs. CEMS flowrate data; such comparison was not required by 40 CFR Part 75. GGS met with EGLE on February 23, 2021 to discuss possible reasons for the observed difference in flow measurements. GGS has diligently undertaken extensive investigation and taken several steps to ensure the quality and accuracy of the CEMS data moving forward. After follow-up discussions, at EGLE's request, GGS agreed to move up its regular 2021 CEMS RATA from the 4th quarter to the 2nd quarter of 2021, utilizing a different entity to conduct the testing. GGS expeditiously arranged for Regulatory Compliance and Testing Services (RCTS), a different air emissions testing body (AETB) certified test group from Consumers Energy Company, to conduct this RATA. RCTS was able to revise their schedule (actually postponing a mercury RATA at Consumers' D.E. Karn site) to accommodate a RATA test at GGS at the end of April 2021. This timing also allowed for the 30-day pre-test submission of a notice and test plan to meet U.S. Environmental Protection Agency (EPA) and EGLE requirements. These actions demonstrate GGS cooperated with EGLE to conduct further analyses in response to the anomalous data as quickly as possible, while maintaining the flow CEMS as prescribed by federal regulations.

On April 26, 2021, the flow CEMS RATA was commenced by RCTS. Three trial flow CEMS RATA runs were conducted on April 26, 2021, at each of the Low, Mid and High operating levels, and the results failed to meet the maximum 10% difference for each run as allowed in 40 CFR §75.20(b)(3)(vii)(E). GGS then confirmed the flow CEMS needed calibrating and amended the stack diameter and pressure values within the flow CEMS to match current conditions. Adjustments were made to the flow CEMS K-factor, and the flow CEMS passed a new RATA on May 3, 2021.

From the point of the failed trial flow CEMS RATA on April 26, 2021, GGS followed prescribed regulatory procedures in 40 CFR Part 75, Appendix B, §§2.3.2(b)(2) and (e) in response to the failed trial flow RATAs, including adjusting the monitor's K-factor as well as other changes (stack dia./pressure). GGS then proceeded to run proper calibrations and a full 3-load flow RATA. Changes to the stack diameter in the Emissions Collection and Monitoring Plan System (ECMPS) electronic monitoring plan were implemented in the Q2 Electronic Data Report (EDR) submission as required by 40 CFR Part 75, §75.61(a)(1). Flow monitor downtime was reported accordingly in the excess emission report due July 30, 2021 according to Part 75, Appendix B, §2.3.2(e), which provides that data is invalidated prospectively from the time of a failed flow RATA attempt through completion of a probationary calibration error test that is followed by a passing RATA.

Response to Alleged Violations

EGLE issued the first VN on June 18, 2021. GGS initially responded to the VN on July 21, 2021. In its initial response, GGS indicated that it would file another more complete response by August 20, 2021, when GGS anticipated more supporting data and analysis would be available.

Alleged Violation 1

Process Description	**ROP Condition (UAR)[2]**	**EGLE Allegation**
EUBOILER	MI-ROP-N2388-2014A, EUBOILER, IV, 2 (40 CFR 60.13, 40 CFR Part 75, R 336.1213(3))	Failure to continuously monitor with a flow CEM installed, calibrated, maintained, and operated in accordance with the procedures set forth in 40 CFR 60.13 and 40 CFR Part 60, Appendix B, or 40 CFR Part 75, as appropriate.

GGS Response:

GGS disagrees with this allegation as we believe we have complied with the requirement to continuously monitor with a flow CEMS installed, calibrated, maintained, and operated within the broad context of the applicable regulations, as further discussed below. Monitor downtime for the short period of re-calibration, even though included in our deviation reporting, is expected and allowed within the Part 60 and 75 regulatory frameworks as long as the appropriate data substitution regimes are applied and issues are addressed expeditiously in accordance with regulatory procedures.

[2] Regarding the Underlying Applicable Requirement (UAR)s for the cited ROP condition, GGS notes that §60.13 does not apply to the flow CEMS. EUBOILER is subject to 40 CFR Part 60, Subpart Db—Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units. The only scenario in which a flow CEMS is referenced within this regulation is §60.48b(j) as an alternative to a Continuous Opacity Monitoring System (COMS) for certain units. However, GGS utilizes a COMS to ensure compliance with EUBOILER Condition I.4 (a 10% visible emission limit which subsumes the Subpart Db opacity standard §60.43b(f)). GGS believes that the §60.13 citation only applies to those CEMS required by 40 CFR Part 60, Subpart Db, specifically, the NO_x, SO_2 and CO_2 CEMS.

The prior/original flow CEMS was installed around 2008 because of EUBOILER being subject to the Clean Air Interstate Rule (CAIR), which adopted the monitoring provisions of 40 CFR Part 75. EUBOILER is also subject to CAIR's successor, the Cross-State Air Pollution Rule (CSAPR), which also requires the flow CEMS and adopts the 40 CFR Part 75 monitoring provisions.

Regarding proper installation of the flow monitor, Recertification testing of the current flow monitoring system was completed in November 2017, including a 7-day calibration error test and RATA as required in §75.20(c)(2). GGS submitted a certification attestation to EPA and EGLE in December 2017. The RATA report was revised and re-issued in March of 2018, with EGLE approval of the RATA report and Recertification of flow CEMS installation on March 13, 2018, and April 9, 2018, respectively. The RATA acceptance and flow CEM certification approval letters are included in Appendix A of the Technical Memorandum.

With respect to proper calibrations, compliance with the related 40 CFR Part 75 flow monitoring requirements is documented in the quarterly EDRs as submitted to the US EPA through their ECMPS software. These quarterly EDRs include the results of all required daily calibration error tests (40 CFR 75, App. B, §2.1.1) and flow interference checks (40 CFR 75, App. B, §2.1.2), quarterly flow-to-load ratio or gross heat rate evaluations (40 CFR 75, App. B, §2.2.5) and semi-annual or annual RATAs (40 CFR 75, App. B, §2.3). Per both the EPA and EGLE, the RATA is the most rigorous of the various Part 75 quality assurance tests. Prior to the 2020 flow RATA, neither agency took exception to the flow RATAs that were conducted for EUBOILER.

In terms of proper maintenance and operation, it was a maintenance concern which resulted in replacement of the historic cross-stack ultrasonic flow CEMS with the short measurement path ultrasonic flow CEMS installed in October of 2017. As more fully discussed in Section 2.1 of the Technical Memorandum, moisture was collecting in the lower of the two flow transducers and affecting the reliability of the equipment.

As noted above, the flow meter first failed a 40 CFR Part 75 RATA on April 26, 2021, based on the trial runs that were conducted. This incident was resolved when the flow meter was adjusted and passed the follow-up RATA on May 3, 2021. GGS affirms that the duration of flow monitoring downtime was seventy-one (71) hours from April 26, 2021 (time of failed RATA) to April 29, 2021 (time of passed probationary calibration), and this downtime was reported as a deviation in the associated ROP semi-annual report.

The duration of this incident was from April 26, 2021 through May 3, 2021. GGS acknowledges that the November 2020 flow RATA data appears anomalous when compared to the near-term emissions testing flow data and April 2021 flow RATA data. As explained in the accompanying Technical Memorandum, GGS has not identified the definitive cause for this difference, although it has identified several factors that may have contributed to it, including the facts that (i) the data was obtained using two different EPA reference methods, (ii) the shorter duration of the RATA flow test, and (iii) the boiler was in near-upset condition in November 2020 due to decomposed, wet fuel following the extended outage. Further detail on these concepts as well as a thorough discussion of probe placement/location and re-linearization through a K-factor adjustment is presented in the Technical Memorandum. This document also addresses EGLE's request to retroactively consider data gathered between late 2017 and the April 2021 RATA, and it provides observations which could contribute to data anomalies observed.

GGS believes that at all times, including the 2021 RATA calibration incident noted above, the flow CEMS was installed and operated in accordance with the ROP monitoring requirements, and specifically, 40 CFR Part 75, which provides detailed requirements for installing, operating, and maintaining CEMS. In cases where the flow CEMS was not able to provide quality assured data,

substitute flow CEMS data was properly calculated in accordance with 40 CFR §75.33 and reported to the EPA; such data was noted as missing in required excess emissions reports submitted to EGLE.

Alleged Violation 2

Process Description	ROP Condition (UAR)	EGLE Allegation
EUBOILER	MI-ROP-N2388-2014A, EUBOILER, VI, 1 (40 CFR 60.13, 40 CFR Part 75, R 336.1213(3))	The permittee shall monitor and record the nitrogen oxides emissions, sulfur dioxide emissions, carbon dioxide concentration and exhaust flow rate of EUBOILER on a continuous basis in accordance with 40 CFR Part 75.

GGS Response:

This allegation is identical to *Alleged Violation 1* because the VN does not challenge the quality of the gas CEMS data, but the flow CEMS data is used in conjunction with the gas CEMS data to monitor the respective pollutants. GGS notes that it has monitored and recorded nitrogen oxides emissions, sulfur dioxide emissions, carbon dioxide concentration and the exhaust flow rate of EUBOILER on a continuous basis in accordance with 40 CFR Part 75. However, as noted in the response to *Alleged Violation 1*, the flow CEMS failed the RATA on April 26, 2021. This incident was resolved when the flow CEMS passed a new RATA on May 3, 2021.

Alleged Violation 3

Process Description	ROP Condition (UAR)	EGLE Allegation
EUBOILER	MI-ROP-N2388-2014A, EUBOILER, VII, 2 and 3 (R 336.1213(4)(c)	Failure to report and certify deviations from compliance as required in annual certifications of compliance and semi-annual deviation reporting.

GGS Response:

GGS disagrees with this alleged violation. Based on our review of our historic data as discussed within the attached Technical Memorandum and to the best of our knowledge, all deviations, as well as all corrective measures prescribed by 40 CFR Part 75, were reported within the relevant timeframes. Flow monitor downtime was reported accordingly in the excess emission report due July 30, 2021 according to Part 75, Appendix B, 2.3.2(e), which provides that data is invalidated prospectively from the time of a failed flow RATA attempt. GGS has reported the incidents cited in the response to *Alleged Violations 1 and 2* in its semi-annual deviation report, submitted to EGLE on July 28, 2021.

At all times except for brief periods of monitoring downtime as previously reported, the plant has monitored its emissions in accordance with the very prescriptive requirements of 40 CFR Part 75, as required by the ROP. GGS completed flow monitor recertification in 2017, which was approved by EGLE, and submitted subsequent RATAs as required by 40 CFR Part 75 in 2018, 2019, 2020 and 2021. Moreover, GGS adjusted the flow monitor in response to the April 2021 RATA as prescribed by 40 CFR Part 75. The applicable federal regulation provides a detailed compliance path for a flow monitor that does not pass relative accuracy testing. GGS strongly believes that this path is appropriate for its ongoing CEMS monitoring, and an additional enforcement response

is unnecessary.

In conclusion, per EGLE's request, GGS has re-assessed historical flow data and presented our findings in the attached Technical Memorandum and has found no basis for invalidation of flow data from the 2017 installation of the flow monitor forward. While we have not identified a rationale or hard evidence to invalidate data, GGS understands EGLE's desire to identify a sole and definitive cause of the data anomaly described in the VN. GGS seeks to continue these discussions with EGLE and EPA, as appropriate, outside of the context of any escalated enforcement action. We propose a meeting with EGLE and EPA representatives after they reviewed this letter and attached Technical Memorandum. This meeting would be for the purpose of discussing the information presented herein and to identify additional data or investigations that may be useful.

It is our hope to meet with your team in person, or through video conference, to present this case to you and come to a satisfactory conclusion for all parties. Please contact me should you require any further clarifications.

Sincerely,

Edward Going
Plant Manager

cc: Ms. Karen Kajiya-Mills, EGLE-AQD
Ms. MaryAnn Dolehanty, EGLE-AQD
Ms. Jenine Camilleri, EGLE-Enforcement
Mr. Shane Nixon, EGLE-AQD
Mr. Neil Pansey, CMS Enterprises
Mr. Richard Laur, GGS
Ms. Kathryn Cunningham, CMS Enterprises
Mrs. Linda Hilbert, CMS Enterprises
Mr. Scott Sinkwitts, Esq., Consumers Energy
Mr. Louis Nichols, EPA Clean Air Markets Division
Mr. Charles Frushour, EPA Clean Air Markets Division

Enclosures:
Attachment 1 – July 21, 2021 Initial Response to the June 28, 2021 EGLE Violation Notice
Attachment 2 – Technical Memorandum

Attachment 1

GGS July 21, 2021 VN Response

Grayling Generating Station

4400 West Four Mile Road
Grayling, Michigan 49738
(989) 348-4575

July 21, 2021

Mr. Jeremy Howe
Environmental Air Quality Analyst
Michigan Department of Environment, Energy, and Great Lakes (EGLE)
Cadillac District Office
120 West Chapin Street
Cadillac, MI 49601-2158

Via e-mail (howej1@Michigan.gov) and UPS

RE: Response to Violation Notice issued June 18, 2021
Grayling Generating Station Limited Partnership [SRN: N2388]
Failure to Continuously Monitor Emissions Utilizing Flow CEMS

Dear Mr. Howe:

Grayling Generating Station, LP (GGS) is providing this response to the Violation Notice (VN) issued by Michigan Department of Environment, Energy, and Great Lakes (EGLE) on June 18, 2021 that alleges failure to properly operate and maintain a flow monitoring system, as well as a failure to continuously monitor emissions, and timely report such as deviations. Also contained in the VN is an indication that EGLE considers GGS flow data "suspect" from the time that the current flow monitor was installed in October 2017 through the most recent flow Relative Accuracy Test Audit (RATA) in April and May 2021. The initial VN response due date was July 9, 2021 and EGLE approved an extension request to July 21, 2021 in recognition of limited staff resources in July due to various state and federal quarterly reporting activities. EGLE further indicated that the July submission should be more of an "initial response" that declares GGS's position on the allegations, as well as laying out a timeframe for a "follow-up" submission which will provide further support for GGS's position on these matters. This response therefore outlines GGS's position as well as proposes that a follow-up response be submitted to EGLE by August 20, 2021.

Background

EGLE has observed an inconsistency of stack flow rates in two separate test reports for the annual flow RATA and the 5-year Renewable Operating Permit (ROP) stack tests conducted in November of 2020. Specifically, EGLE noted that the stack flow during the 2020 Reference Method (RM) testing for ROP constituents was reading higher than the previous day during the 2020 flow RATA

testing. EGLE further investigated clock hour average Continuous Emission Monitoring System (CEMS) flow readings overlapping the ROP stack testing times and did a "RATA like" comparison to calculate a Relative Accuracy (RA) of about 20%. EGLE brought this comparison to the attention of GGS on February 5, 2021 via email from Mr. Jeremy Howe. GGS investigated reasons that may have caused the difference in readings and presented sound, engineering based plausible explanations to EGLE in a presentation during a teleconference meeting on February 19, 2021 (see attached). The outcome of that meeting was an agreement to conduct a new flow RATA for the stack flow CEMS. GGS decided to conduct the gaseous RATA during the same test event to align the gas and flow RATA testing frequency to second quarter as opposed to the fourth quarter based on the timing of the 2020 RATAs. The RATA was scheduled for the end of April 2021, per test team availability and compliance with the 30-day notice requirement.

The 2021 RATAs utilized Consumers Energy Company's Regulatory and Compliance Testing Services (RCTS) in lieu of the previous testing/RATA contractor (Network Environmental, Inc.) and commenced on April 27, 2021. The RATA testing was witnessed by K. Cunningham of CMS Enterprises and Rebecca Radulski (District Inspector), Jeremy Howe (Technical Programs Unit, or TPU) and Lindsey Wells (TPU) from EGLE. Initial flow RATA testing was performed using allowable (see 40 CFR Part 75, Appendix B 2.3.2) three run trial tests at each operating level (low, medium, and high) to help determine if adjustment of the flow CEMS was needed. Flow monitors often incorporate mathematical adjustments of their output to ensure better alignment with the RM readings. These adjustments take different forms depending upon the make/model of the flow CEMS and include lookup tables, polynomial equations, and K-factors, with the latter being applicable to the FLOWSIC100 PR installed at GGS.

It became apparent during the trial flow RATA runs that a change to the K-factor was required at all three operating levels to ensure better alignment with the RM values. Changes to the flow system was contracted to the flow CEMS vendor, SICK. Flow testing re-commenced on April 29. 2021 after adjusting the K-factor associated with the flow CEMS. A probationary calibration was first passed, and then the official 3-load flow RATA was conducted and completed on May 3, 2021, with flow passing at all loads at less than 7.5% relative accuracy (RA), thus qualifying for annual flow RATA testing. The RATA report was submitted on June 11, 2021, and EGLE issued the Violation Notice on June 18, 2021. A teleconference meeting was held between CMS Energy subsidiary Environmental support, GGS personnel, and EGLE on June 23, 2021 to discuss the VN as well as to verbally request an extension to respond to the VN. A written extension request was submitted by GGS on June 25, 2021, with an EGLE response on June 30, 2021 extending the initial response deadline to July 21, 2021.

Current Allegations

EGLE observations suggest the flow data is "invalid" from October 2017 to April 2021, which corresponds back to the date of GGS flow monitor installation up to the current RATA. EGLE alleges that the flow monitor may not have been properly installed in 2017 and has been reading low since then; thus, potentially compromising reported emissions data. As listed in the VN, EGLE has alleged 3 violations:

1. *Failure to continuously monitor with a properly installed, calibrated, maintained, and operated flow CEMS.*

2. *Failure to monitor and record NO_x, SO_2, and CO emissions on a continuous basis (lb/hr emission rates utilize flow in their calculation),*
3. *Failure to report and certify deviations in the semi-annual reports and annual compliance certification.*

Initial Regulatory Assessment

As discussed during the February 19, 2021 conference call, GGS and EGLE are in alignment that the corrective action has already been implemented via adjustment of the K-factor and other minor changes to the flow monitor configuration on April 29, 2021. Furthermore, the plant has been operating in compliance with permit limits and monitoring requirements since the probationary calibration on April 29, 2021 (after the preceding changes were completed) and subsequent passing of the 3-load flow RATA.

GGS disputes EGLEs claim that the flow monitor was not reading correctly since the date of its installation in October of 2017. Certification of the current flow monitoring system was completed on November 1, 2017, with submission of the certification report to the U.S. Environmental Protection Agency (EPA) and EGLE on December 22, 2017. The flow CEMS has been properly maintained since that time, with passing quality assurance (QA) checks including required daily calibration error tests, quarterly flow-to-load ratio checks and periodic RATAs. Both EPA and EGLE have been provided RATA test notices and protocols, and the RATAs have generally been witnessed by EGLE, with no dispute over previously submitted RATA reports or EDR QA submissions. GGS will provide further information on the flow monitor operation in our next submission.

1. Failure to continuously monitor with a properly installed, calibrated, maintained, and operated flow CEM

GGS disputes this claim, as GGS followed EPA (40 CFR Part 75) requirements for installation and certification of the flow monitor in 2017. GGS has continuously operated and maintained the flow CEMS in accordance with Part 75 regulations which include daily calibrations, quarterly flow-to-load ratio checks and periodic RATA testing.

Prior RATA tests indicated that there was not an issue with the flow CEMS until EGLE questioned the stack test report flows via email correspondence from J. Howe on February 5, 2021. GGS provided plausible explanations for EGLE's observed differences in flow during the 2020 testing activities. EGLE was on site to witness the stack testing in November of 2020, and no issues were raised at the time of testing. GGS subsequently confirmed the flow CEMS needed calibrating during the April 2021 RATA, as well as amended the stack diameter and pressure values within the flow CEMS to match current conditions. From the point of the failed initial flow trials, GGS followed prescribed regulatory actions to adjust the K-factor as well as other allowed changes (stack dia./pressure), and then proceeded to run proper calibrations and full 3-load flow RATA. Changes to the stack diameter in the Emissions Collection and Monitoring Plan System (ECMPS) will be implemented during the 2021 Q2 Electronic Data Report (EDR) data submission. Flow monitor downtime will be reported accordingly in the next excess emission report due July 30, 2021 (as described in Item 3). Monitoring requirements in

Part 75, Appendix B, 2.3.2 (f) stipulate that downtime is acquired prospectively from the time of a failed flow RATA attempt, not retroactively as suggested by EGLE.

GGS is in the process of reviewing historical passed flow RATA test results, daily calibrations, and the quarterly system reviews provided by Data Acquisition and Handling System (DAHS) vendor (VIM Technologies, Inc.). GGS is also analyzing stack flow trends, flow to load and heat input to load ratios, and control charts before and after the 2017 new flow CEMS installation. The results of that review will be included in our subsequent response.

2. ***Failure to monitor and record NO_x, SO_2, and CO emissions on a continuous basis (lb/hr emission rates that utilize flow in their calculation)***

Within this citation, it is presumed that EGLE is referring to the mass emission limits for the noted pollutants, as the flow CEMS data is not used to arrive at lb/mmBtu emission rates for these pollutants. Our explanation above for Item 1 covers this allegation as well. Except for any previously reported flow monitor or gaseous CEMS downtime, which was minimal, GGS did continuously monitor and record the emissions of these pollutants.

3. ***Failure to report and certify deviations in the semi-annual reports and annual compliance certification***

GGS has followed 40 CFR Part 75 regulatory requirements for quality assurance and quality control of our flow CEMS since installation in 2017. GGS did not have any evidence that suggested non-compliance or see any reason to report flow monitoring deviations historically. We have a robust process for identifying deviations at GGS and certified all reports with the best available data at the time of the submittal. Potential flow CEMS anomalies were pointed out in February of 2021. As a result, GGS undertook RATAs several months earlier than required, completing said RATAs in late April and early May 2021. Even if EGLE presumes deviations existed, we cannot reasonably be expected to report a deviation we were unaware of at the time.

There can be only speculation and conjecture as to exactly when the flow CEMS began to consistently read low relative to RM (if that is indeed the case). GGS is not aware of a prescribed evaluation tool that can determine when the CEMS flow probe lost its calibration. GGS followed the regulations and prescribed methodology on correcting the flow probe problem once the evidence became apparent during the trial RATA. In the next excess emissions and downtime monitoring report due to the agency by July 30, 2021, GGS will report flow CEMS monitoring downtime from the time of the failed trial RATAs on April 27, 2021, up through the time of the probationary calibration following changes to the K-factor, in accordance with 40 CFR Part 75, Appendix B.

Summary

As previously stated, Grayling Generating Station does not believe that a Violation Notice was warranted for the reasons explained above. GGS desires additional time to review several years' worth of historic data to provide additional context for the trends EGLE has observed since installation of the current flow CEMS back in October of 2017. We firmly believe that the historic flow data is valid based upon the prescribed QA procedures, and we are confident that additional data review will help to alleviate EGLE's concerns. As discussed previously, GGS

respectfully requests a submission deadline of August 21, 2021 to compile and review this additional information and submit the analysis to EGLE.

If you have questions regarding this initial response, please contact me at (989) 348-4575 Ext. 111 or Kathryn Cunningham at (517) 375-3043. Thank you for your consideration in this matter.

Sincerely,

Edward A. Going
Plant Manager
Grayling Generating Station, LP

cc: Ms. Karen Kajiya-Mills, EGLE-AQD (via email)
Mr. Shane Nixon, EGLE – AQD (via email)
Mr. Richard Laur, GGS
Ms. Kathryn Cunningham, CMS Enterprises

Attachment – Stack Test Meeting PowerPoint (Feb.23, 2021)

CMS ENERGY
Enterprises

Grayling Generating Station
November 2020 Stack Test Events

Meeting with Michigan Department of
Environment, Great Lakes, and Energy (EGLE)
February 23, 2021

Introduction

Purpose

- Meeting with EGLE and GGS personnel to discuss questions regarding stack flow measurements during annual RATA and ROP required testing (every 5 years)

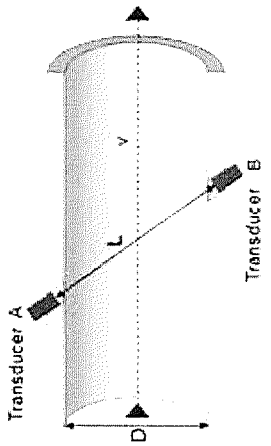
Background

- Biomass boiler unit came down in March 2020 for planned outage which was extended for turbine LP rotor repair. Unit came back on-line at end of June; however, the generator experienced a ground fault in early July which kept the unit off-line until the end of October.
- New gaseous CEMS were installed in April 2020, during the planned outage (new flow CEMS were installed back in 2017)
- RATA testing for certification of the new gaseous CEMs and quality assurance for the flow CEMS was scheduled to be conducted within the 720-unit operating hour required timeframe. ROP required testing was scheduled during the same timeframe.
- The fuel quality seemed to be an issue during the week long test event as it had begun to degrade during the 7-month shutdown and had a higher than normal moisture content.

CEMS Flow Monitors - Ultrasonic

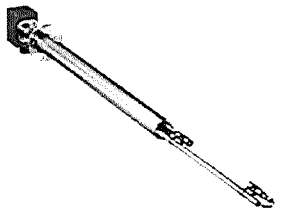
Previous Sick Flow monitor - SICK Model FLA100-D

- Cross stack guided radar (i.e., ultrasonic) – measured flow across entire stack diameter.
- Replaced in 2017 during outage due to moisture causing corrosion in upward facing signal probe.
- Step change in flow rate following the 2017 outage during which the flow CEMS was replaced due to concurrent repair of in-leakage from primary air heater.



Current Sick Maihak – 100PR "Short Path"

- Measures approximately 11 inches of flow path vs. the entire 92" diameter
- 45-degree angle down squared 90 degree to stack wall.

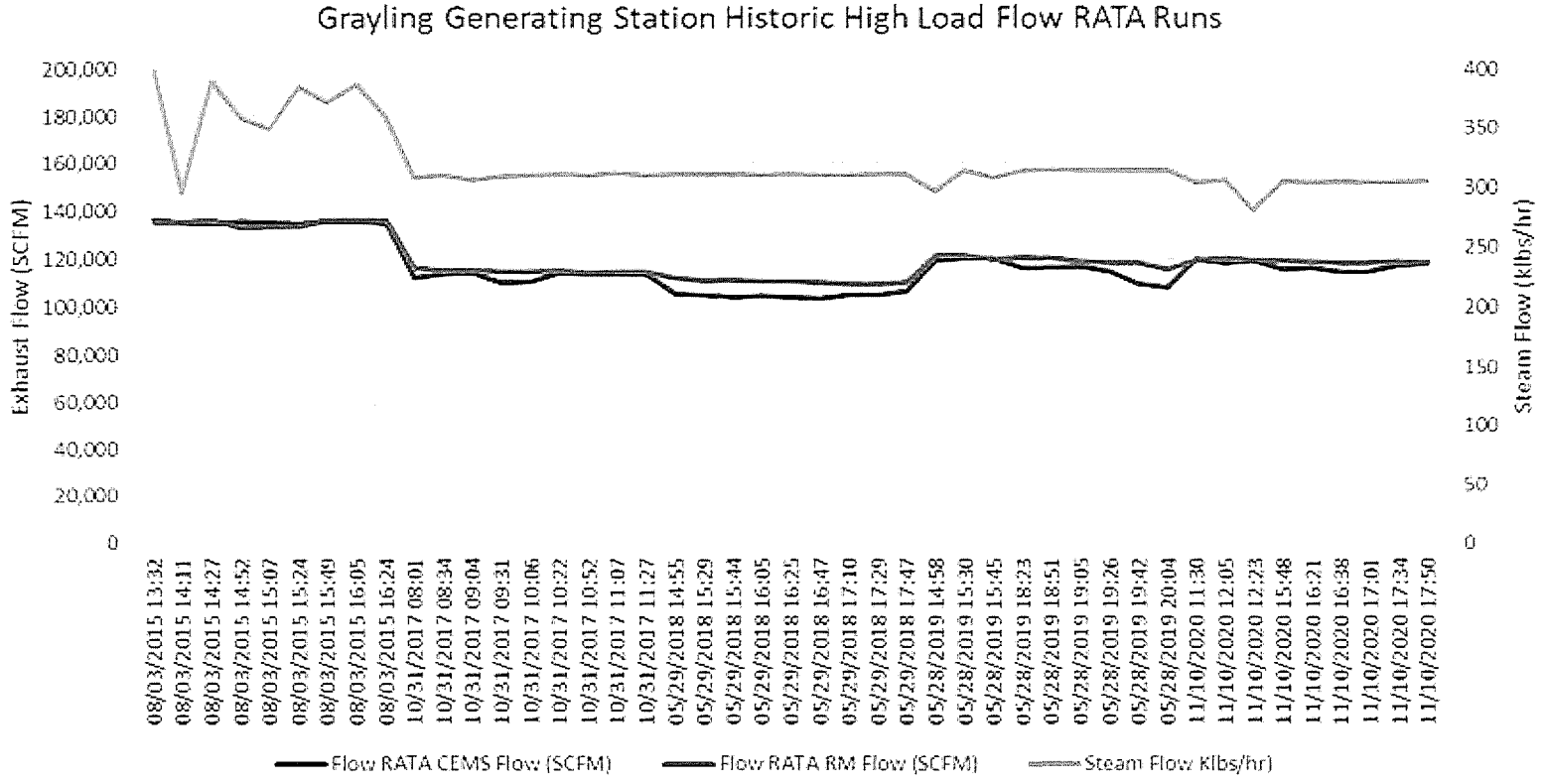


FLOWSIC100 PR
Ideal for one-sided installation with stack diameters from 1 m

Test Results

- High load flow CEMS RATA passed on 11/10/2020 at 2.54% RA
  - Flow CEMS passed 3-load RATA in 2017: 5.74% RA low, 8.70% RA mid, 2.92% RA high.
  - Flow CEMS passed 2-load RATAs in 2018 and 2019 as well. At the high level, the RA was as follows: 2018 = 6.19%; 2019 = 5.04%.
  - 2020 flow RATA flowrates are similar to those measured during 2017, 2018 and 2019 high load flow RATAs.
- ROP testing for PM, Metals, BAP, and H2SO4 are compliant with emission limits – even if flow is biased high.
  - Flows in 2020 are similar to those measured during 2015 ROP tests (were expected to be lower)
- Different flow profiles were observed between RATA and ROP measurements. These tests were not simultaneous (except for some flow RATA runs used to assign exhaust flow rates for the VOC tests on 11/10/2021).

2015-2020 High Load Flow RATA CEMS Vs. RM Results



Flow during RATA and Non-RATA Tests

	2020 Testing					Historical RATAs (High Flow)		
	RATA, High	ROP Testing				2019	2018	2017
Parameter	11/10/2021	PM (11/11)	BAP (11/11-11/12)	H2S04 (11/12/20)	All ROP Runs	5/28/2019	5/29/2018	10/31/2017
Steam (klbs/hr)	302.0	296.2	289.0	290.5	291.9	312.0	311.0	310.0
O2%	3.5	4.5	4.7	4.7		3.65	4.4	5.5
Moisture %	25.25	27.22	24.95	24.95		24.07	23	25
Excess Air	19.70	26.99	29.00	29.00		19.33	40.10	36.00
RM flow (SFCH)	7,141,889	8,582,400	8,629,980	8,630,000	8,581,920	7,179,111	6,643,667	6,910,222
CEM flow (SCFH)	7,048,000	6,915,360	7,066,467	7,136,477	7,039,435	6,957,333	6,298,000	6,789,444
RATA Calc	2.54%	21.62%	17.64%	19.28%	18.94%	5.04%	6.19%	2.92%

	2015 RATA,	2015 ROP			
Flow (SCFH)	High	PM	BAP	H2SO4	All
Steam (klbs/hr)	366.0	307.7	288.4	302.2	299.4
O2%	4.5	5.13	5.10	5.30	
Moisture %	22.6	20.69	20.01	20.53	
Excess Air		32.13	31.89	33.55	
RM flow	8,119,889	8,235,620	8,207,140	7,866,260	8,103,007
CEM flow*	8,140,000	8,006,167	7,754,833	8,105,444	7,955,481
Diff (RM-CEM)	(20,111)	229,453	452,307	(239,184)	147,525
"RATA"	1.01	6.07%	21.82%	6.38%	5.75%

* No minute flow CEMS data is available in relation to the 2015 ROP test. These averages are based upon hourly averages which overlap the ROP test run periods.

Comparison between Measurements

RATA

- Conducted 11/10/2020
- ~36 MW; ~300 klbhr
- wood fuel, 64F ambient temp
- 6 sample pts/2 ports
- Pitot 0.80 cP
- Manual traverse
- ~10 min measurement
- Orsat for diluent

- Similar flowrates as 2017 RATA test

Non-RATA (i.e., PM/Metals, BAP, H2SO4)

- Conducted 11/11, 11/12, 11/13/2020
- ~36 MW; ~291 klbhr
- wood fuel, 41F ambient temp
- 3 sample pts/4 ports
- 3 different Pitot 0.82 to 0.83 cP
- Manual traverse
- ~75 min measurement
- Orsat for diluent

- Similar flowrates as 2015 ROP test

Discussion of Differences

- Part 75 explicitly states in Section 6.5.10 of Appendix A that Reference Method (RM) 2 or its allowable alternatives (except Method 2B and 2E) are to be used for stack gas velocity and volumetric flowrate. Although similar in many respects, RM 2 and RM 5 are slightly different methods for monitoring flow.
  - Length of the flow RATA runs was approximately 11 minutes (5 minute minimum per Part 75), while the PM test runs were approximately 75 minutes (actual sampling time about 60 mins).
  - Flow RATA RM readings represent approximate 1-minute averages/intervals, whereas the PM readings represent approximate 5-minute averages/intervals.
  - The differences in intervals for recording data could contribute to poorer agreement between the CEMS and RM if the exhaust flow/velocity varies over time, as the CEMS would see all such variances. The longer 5-minute intervals for RM5 could miss some level of variance that would be observed at the 1-minute RM2 intervals.
  - Attaching the Pitot tube to the Method 5 probe assembly could introduce aerodynamic interference and/or make it more difficult to ensure that the Pitot remains perpendicular to the direction of flow.

Potential Timing or Port Bias

RATA Runs ~11 min (sample every 0.9 min)

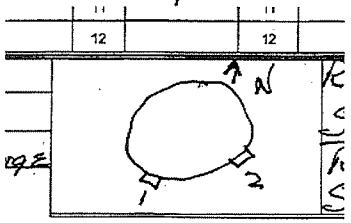
ΔP = 0.96 to 1.10 in H_2O (Run 7 & 8 ex.)

Laminar flow – consistent across traverse

CEMS steady state flow ±6500 SCFM

	BOILER STACK_FLOW_SCFH_P 75 1 min			BOILER STACK_FLOW_P75 1 min		
	SCFH	OS	MS	SCFM	OS	MS
11/10/2020 17:01	6879000	ON	GD	114658.3	ON	GD
11/10/2020 17:02	6696000	ON	GD	111604.2	ON	GD
11/10/2020 17:03	7052000	ON	GD	117525.0	ON	GD
11/10/2020 17:04	6995000	ON	GD	116581.3	ON	GD
11/10/2020 17:05	6984000	ON	GD	116395.8	ON	GD
11/10/2020 17:06	6767000	ON	GD	112787.5	ON	GD
11/10/2020 17:07	6676000	ON	GD	111260.4	ON	GD
11/10/2020 17:08	6896000	ON	GD	114929.2	ON	GD
11/10/2020 17:09	7062000	ON	GD	117693.8	ON	GD
11/10/2020 17:10	6902000	ON	GD	115039.6	ON	GD
Average	6890900			114847.5		
Maximum	7062000			117693.8		
Minimum	6676000			111260.4		
Total	68909000			1148475.1		

High Run #7



ENVIRONMENTAL INCORPORATED

High Load

Run #7 17:01–17:10 | Run #8 17:34–17:43

PITOT TRAVERSE DATA FORM			Date: 11/10/20								
Plant: Grayling Generating Station											
Source: Wood-fired Boiler					Staff: [illegible]						
Stack Size, Inches: 92					Barometric Pressure, "Hg: 28.42						
Gas Temperature, °F Dry:		Wet:			Static Pressure, "H_2O: -1.70 | -1.60						
Pitot Tube#: 2 6'		Standard: X		S-Type	C_p: 0.80						
Port Location - Inches	1 Port	Velocity Pressure "H2O Run #7		2	Velocity Pressure "H2O		1 Port	Velocity Pressure "H2O Run #8		2	Velocity Pressure "H2O	
4.05	1	0.96	382	1	0.98	381	1	0.98	384	1	0.99	385
13.43	2	1.00	383	2	1.05	383	2	1.05	383	2	1.05	386
27.23	3	1.10	384	3	1.10	383	3	1.10	384	3	1.10	386
54.77	4	1.10	384	4	1.10	383	4	1.10	384	4	1.10	386
78.57	5	1.00	384	5	1.05	382	5	1.00	383	5	1.00	385
87.95	6	0.98	384	6	0.98	382	6	0.98	382	6	0.99	384

Potential Timing or Port Bias

2020 ROP

Non-RATA Runs ~75 min (sample ~5 min)

ΔP = 0.95 to **1.60** in H_2O (PM/Metals R2)

Velocity fastest in middle, slow near duct walls in all ROP runs

Plant: Grayling Generating Station – Grayling Date: 11/18/20
Source: Wood Fired Boiler Staff: Eeedmans/Engelhaedt
PM & Metals

Sample #	2	Filter Set #	1	Barometric Pressure	28.28
Nozzle Dia.	0.250	Primary Filter # DH-	Q-882	Initial Gas Meter Reading	6056.450
Control Box #	2	Secondary Filter # BH-		Clock Time Start	11:40
Y.	1.0126	Type Train	EPA-5/29	Time Meter Start	0
Dryer #	11 9G	Mis. H_2O Cond.	362	Time Meter Stop	1 (60 min)
Gas Bag #	2	Initial Leak Check	0.000 ft³/min @ 15 "Hg		
Pitot Tube #	30 C_p 0.83	Final Leak Check	0.005 ft³/min @ 9 "Hg		

Port	Point	ΔP "H2O	ΔH "H2O	Gas Meter Reading	Pump Vac. "Hg	Meter Temp In	Meter Temp Out	Stack Temp °F	Box Temp °F	Time
4	3	1.60	2.73	6660.76	7.0	69	68	352	35	373	11:40
	2	1.50	2.57	665.04	7.5	70	68	262	35	371	11:45
	1	0.95	1.51	668.351	5.5	75	68	258	35	369	11:50
3	3	1.60	2.57	672.51	7.0	75	68	260	34	371	12:00
	2	1.35	2.18	676.48	6.5	79	68	256	35	371	12:05
	1	0.99	1.61	679.817	5.5	82	69	261	36	370	12:10
2	3	1.55	2.50	683.96	7.0	78	69	262	36	372	12:20
	2	1.60	2.59	688.28	8.0	80	70	265	35	372	12:25
	1	1.40	2.27	692.343	7.5	83	70	265	37	371	12:30
1	3	1.60	2.59	696.63	8.0	81	71	258	36	372	12:40
	2	1.50	2.44	700.87	7.5	83	72	264	36	371	12:45
	1	1.20	1.95	704.664	6.5	85	72	262	36	372	12:50

Comments: MF = 3.0014342 2 5137 4774 End Test AT: 12:55

Pitot Tube Leak Test 0.00 @ 6" H_2O

2015 ROP

Non-RATA Runs ~75 min (sample ~5 min)

ΔP = 0.87 to 1.60 in H_2O (PM/Metals R1)

Same type of pressure distribution as 2020, except in 2015, GGS had cross stack transducers

Plant: CMS Grayling Generating Station Date: 10/21/15
Source: Wood Fired Boiler Staff: Eeedmans/Engelhaedt

Sample #	1 – Metals	Filter Set #	Q-8185	Barometric Pressure	28.75
Nozzle Dia.	0.253	Primary Filter # DH-		Initial Gas Meter Reading	290.856
Control Box #	2	Secondary Filter # BH-		Clock Time Start	16:03
Y.	0.9810	Type Train	EPA-29	Time Meter Start	0
Dryer #	4 13G	Mis. H_2O Cond.	260	Time Meter Stop	1 (60 min)
Gas Bag #	4	Initial Leak Check	0.000 ft³/min @ 15 "Hg		
Pitot Tube #	30 C_p 0.82	Final Leak Check	0.000 ft³/min @ 8 "Hg		

Port	Point	ΔP "H2O	ΔH "H2O	Gas Meter Reading	Pump Vac. "Hg	Meter Temp In	Meter Temp Out	Stack Temp °F	Box Temp °F	Time
1	3	1.40	2.72	295.46	5.0	76	77	368	270	16:03
	2	1.15	2.24	299.75	5.0	80	76	368	255	16:08
	1	0.87	1.71	303.507	4.5	84	76	366	252	16:11
2	3	1.30	2.53	307.69	4.0	78	76	367	266	16:25
	2	1.25	2.45	312.14	5.0	86	76	367	250	16:30
	1	0.97	1.91	316.109	5.0	89	76	366	265	16:35
3	3	1.60	3.12	320.99	6.0	79	77	367	247	16:48
	2	1.35	2.68	325.62	6.0	86	77	368	253	16:53
	1	1.10	2.17	329.825	5.5	90	77	368	270	16:58
4	3	1.60	3.13	334.76	6.5	83	77	368	248	17:07
	2	1.40	2.76	339.49	6.5	89	78	368	256	17:12
	1	1.10	2.17	343.692	6.0	91	78	369	272	17:17

Comments: MF = 3.0014342 End Test AT: 17:22

Pitot Tube Leak Test 0.00 @ 6" H_2O

Other Considerations

- Pitot mis-alignment during non-RATA traverses? Most likely would not result in that high of an error - more likely 3-7%.

- Difference in excess air from 11/10 (20%) vs. 11/11-11/12 (27-29%) could have changed flow dynamic in the stack causing different velocities captured in a M5 traverse vs a "short path" CEMS (see slide 3).

- Plugging of the Pitot tips or moisture in the Pitot lines? This is possible with "poor" combustion and the high levels of moisture that were observed, and could cause higher velocity measurements.

Conclusion

GGS believes that the RATA and the ROP testing were successful on their own merit according to the prescribed test methods. After fixing air in-leakage from the primary air heater in 2017, the replacement flow CEMS has consistently showed acceptable agreement with the RM2 data, and the CEMS/RM data for 2020 was consistent with the prior data for similar loads.

Any number or all of described issues combined could have caused the difference in the RM flowrates between the ROP test and the RATA test. They are different methods; however, both RM2 and RM5 traverse the stack – vs. the CEM, that has a short/fixed path.

The boiler obviously had operational issues due to degraded fuel and operators were battling to keep a steady high load for the flow RATA and the ROP test. This may have caused unusual stack flow path conditions. Due to these issues, the RM5 flow data may exhibited a "high bias", causing mass loading emission rates to be conservatively higher; however still in compliance with ROP limits.

GGS has scheduled the next RATA for week of April 26th.

Attachment 2

Technical Memorandum

Attachment 2.0 – Technical Memorandum

Table of Contents

Appendices:

Appendix A
EGLE approval of 2017 re-certification RATA and flow monitor installation

Appendix B
RATA History Summary, 2017-2021
EGLE observational field notes of 2018 and 2019 testing

Appendix C
EGLE email of July 28, 2021 from J. Howe

Appendix D
DAHS Reports from VIM

Appendix E
Timeline of Events

1.0 Current Allegations and Regulatory Response

EGLE has questioned whether the flow data is "invalid" from October 2017 to April 2021, which corresponds back to the date of GGS flow monitor installation up to the latest RATA. EGLE alleges that the flow monitor may not have been properly installed in 2017 and has been reading low since then; thus, potentially compromising reported emissions data. GGS disagrees with this allegation/inference for two reasons. First, the flow monitor was re-certified and approved by EGLE pursuant to applicable procedures specified by 40 CFR Part 75. Second, the long-term flow to load data presented by EGLE in the VN in support of this inference uses improperly commingled data. When properly isolating flow values at discrete load settings, the long-term flow data trend noted in the VN disappears or at least is far less apparent.

Regarding the approval of the 2017 recertification application, pursuant to §75.20(a)(4), the EPA has 120 days from the receipt of a complete application to issue notice of formal approval or disapproval. If EPA does not issue such notice, the associated monitoring system(s) are deemed to be recertified after the 120-day period lapses. For the 2017 flow monitor replacement, the 120-day period would have lapsed on April 21, 2018; GGS never received formal notice of approval or disapproval from the EPA. As noted previously, an approval was provided by EGLE within the 120-day period.

Notwithstanding the preceding, EPA does have the ability to issue a notice of decertification in accordance with §75.21 based upon audit results. Specifically, §75.21(e)(1) provides that EPA may find, based upon a field or data audit, that a previously recertified system should not have been recertified and can revoke the recertification. However, this regulation expressly states that, if the EPA issues a formal decertification notice, the certification status is revoked **prospectively**. The data remains invalid between the date of issuance of the decertification notice until the date and time that the owner or operator completes subsequently approved recertification tests.

At this point in time, there has been no formal notice of decertification of the flow CEMS from the EPA. GGS was first put on notice of a possible problem with an ongoing QA test requirement (e.g., RATA) via an email from Mr. Jeremy Howe on February 5, 2021 (regarding the November 2020 recertification RATA). There has been no allegation that the flow CEMS recertification tests in 2017 were invalid, nor has there been any allegation that we failed to properly conduct valid QA tests from 2017 through the 3rd quarter of 2020.

The preceding suggests that EGLE's attempt at invalidating flow CEMS data all the way back to initial recertification in 2017 is not congruent with EPA's process for de-certifying a previously certified system. Again, EGLE issued notice of approval of the recertification application, and a lack of formal notice from EPA is also treated as approval. The concept in §75.21(e)(1) regarding **prospective** data invalidation as a result of an audit leading to decertification provides some level of protection against excessive downtime in the event that the regulatory agency alleges an issue with a previously certified or recertified CEMS long after the associated testing was completed.

GGS has continuously operated and maintained the flow CEMS in accordance with Part 75 regulations which include daily calibrations and interference checks, quarterly flow-to-load and/or

gross heat rate-to-load ratio checks and periodic RATA testing. Both EPA and EGLE have been provided RATA test notices and protocols, and the 2017-2019 RATAs have been witnessed by EGLE, with no dispute over previously submitted RATA reports or EDR QA submissions. A summary of the RATA history is presented in Appendix B, along with observational field notes from EGLE witnesses during the testing activities.

Initial questioning of the November 2020 RATA test came from an email correspondence from EGLE on February 5, 2021, when an unorthodox comparison of stack flow during emissions testing vs. CEM data was made during review of RATA and ROP test reports (both tests conducted using different EPA Reference Methods within roughly the same time period). GGS met with EGLE on February 23, 2021 to present plausible reasons for the flow observations. GGS agreed to move up 2021 flow RATA testing from the 4th to 2nd quarter of 2021 to address EGLE's concern. GGS subsequently confirmed the flow CEMS needed calibrating during the April 2021 RATA, as well as amended the stack diameter and pressure values within the flow CEMS to match current conditions. From the point of the failed initial flow trials, GGS followed prescribed regulatory actions to adjust the monitor's K-factor as well as other allowed changes (stack dia./pressure), and then proceeded to run proper calibrations and a full 3-load flow RATA. Changes to the stack diameter in the Emissions Collection and Monitoring Plan System (ECMPS) were implemented in the Q2-2021 Electronic Data Report (EDR) submission. Flow monitor downtime was reported accordingly in the excess emission report due July 30, 2021 according to Part 75, Appendix B, §2.3.2(e), which stipulates that downtime is acquired prospectively from the time of a failed RATA attempt, not retroactively as suggested by EGLE.

GGS has also analyzed stack flow trends, flow to load ratios, and control charts before and after the 2017 new flow CEMS installation, and related findings are presented in this technical response.

2.0 Technical Responses to EGLE

In order to adequately respond to the issues raised in the VN, this section documents GGS's responses in the order of concerns spelled out in EGLE's VN clarification email of July 28, 2021, as this seems to represent the specific issues that EGLE has requested we address. The actual email can be found in Appendix C. We have responded to each concept as presented below, with EGLE's comments in italics.

EGLE: After reading the initial response, AQD maintains the stance that GGS needs to reassess the flow monitor's downtime. To my (J. Howe) knowledge, the only QA check that confirms correct probe location within the stack is a RATA.

> Response: GGS generally agrees with the underlined statement and re-asserts that the certification RATA in 2017 and subsequent RATAs (2018-2020) and required QA/QC were all passed within prescribed Part 75 tolerances. Therefore, after reassessing the flow monitoring downtime and QA/QC history, GGS has no other conclusion than the flow monitor was correctly installed and was operating within the applicable 40 CFR Part 75 performance specifications and QA requirements. We believe that there is agreement among EPA, EGLE and GGS, that the RATA is the most important QA check.
>
> Furthermore, GGS utilizes VIM Technologies, Inc. (VIM) as their data acquisition and

handling system (DAHS) vendor. VIM provides services to monitor the overall health of the monitoring system by providing what they call "COMPAS Reports", which serves as an additional QA check. VIM provides these reports time to time, but always with a quarterly review around the time of EDR reporting. A sampling of the quarterly COMPAS reports are contained in Appendix D, specifically for the controversial time periods, Q4-2017, Q4-2020, and Q1-2021. None of the reports reviewed for the period of Q4- 2017 through Q2-2021 highlight concerns over the monitoring system (gas or flow) parameter tolerances. These reports are reviewed by the plant Environmental Coordinator and Instrument and Calibrations Technician as part of on-going QA/QC and due diligence of system operations.

EGLE: The monitor failed a RATA using the flows from the nine stack test runs in Nov 2020. (see Table 2.1)

Table 2.1 Table Created by Jeremy Howe as presented in the VN issued by EGLE:

High Flow RATA created from November 2020 stack tests (kscfh)				
CEM SN	FLOW = 16438615			
Run	RM	CEM	d	
1	8570	6818	1752	PM/Metals R1
2	8591	6915	1676	PM/Metals R2
3	8586	6983	1603	PM/Metals R3
4	8478	7037	1441	BAP R1
5	8586	7101	1485	BAP R2
6	8536	7071	1465	BAP R3
7	8617	7096	1521	H2SO4 R1
8	8596	7148	1448	H2SO4 R2
9	8676	7123	1553	H2SO4 R3
AVG	8582	7032	1549	
Sd			108	
CC			83	
RA			**19.03**	
BAF			1.22	

Response: GGS disagrees with this statement as the actual stipulated RATA test conducted with EPA Reference Method 2 (RM2) vs. the flow CEMS resulted in a relative accuracy (RA) of less than 5% (passage criteria = 10%) with a Bias Adjustment Factor of 1.035. The "RATA" comparison that J. Howe is referencing is between reference method (RM) data utilizing Methods 5, 23 and 8 from three separate test events - a Particulate Matter (PM) test, a Benzo-a-Pyrene (BAP) test, and a Sulfuric Acid (H_2SO_4) test and then comparing that flow data to overlapping clock hour average CEMS data (obtained from EPA). There is no regulatory basis for this comparison to be called a "RATA", as confirmed by EPA during the teleconference of August 5, 2021.

As pointed out in our previous discussion with EGLE, GGS identified several reasons that may contribute to a difference in the RM flow values when compared to the CEMS. One of these was the differences in reference methods, which can add to the uncertainty of the comparison. Some of these differences are described below:

- Part 75 explicitly states in Section 6.5.10 of Appendix A that Reference Method (RM) 2 or its allowable alternatives (except Method 2B and 2E) are to be used for stack gas velocity and volumetric flowrate. Although similar in many respects, RM 2 and RM 5 are slightly different methods for monitoring flow.
    - Length of the flow RATA runs was approximately 11 minutes (5-minute minimum per Part 75), while the PM test runs were approximately 75 minutes (actual sampling time about 60 mins).
    - Flow RATA RM readings represent approximate 1-minute averages/intervals, whereas the PM readings represent approximate 5-minute averages/intervals.
    - The differences in intervals for recording data could contribute to poorer agreement between the CEMS and RM if the exhaust flow/velocity varies over time, as the CEMS would see all such variances. The longer 5-minute intervals for RM5 could miss some level of variance that would be observed at the 1-minute RM2 intervals.
    - Attaching the Pitot tube to the Method 5 probe assembly could introduce aerodynamic interference and/or make it more difficult to ensure that the Pitot remains perpendicular to the direction of flow.

This data anomaly can happen as this type of analysis is not standard and is certainly not cause to negate the actual RATA test, as these are conducted with different test methods and time frames. EPA has agreed that this type of comparison does not constitute a RATA test, but rather provides information that could prompt an investigation into the accuracy of the CEMS data.

When the flow irregularity between RM5 and the CEMS data was brought up to GGS, we engaged with EGLE to try and determine a reason for the anomaly in the data comparison and subsequently did conduct another RATA as expeditiously as possible. When trying to understand how the flow results in 2020 could be different despite similar loads, we examined the 2020 and 2021 flow RATA results in greater detail. Differences between the 2021 and prior RATAs include the following:

1. The differential pressure readings prior to the 2021 RATA were obtained via an oil-filled manometer, whereas the 2021 RATA utilized pressure transducers.

2. The 2021 flow traverse included a total of 16 sampling points (8 per each diameter), whereas the prior flow traverses included 12 sampling points (6 per diameter).

With regard to the differential pressure measurement techniques, many inclined-vertical manometers have 0.01 inch H_2O divisions in the 0-1 inch range, and then 0.1 inch H_2O divisions in the 1 to 10 inch scale. The differential pressures observed at the high load condition generally fall within the 1-2 inch H_2O range, resulting in greater precision for the measurements obtained via the pressure transducer which records differential pressure to the thousandths throughout the entire measurement range. Also, the pressure transducer measurements are based upon multiple readings per traverse point (readings are taken every 2.5 seconds), and this again would be expected to improve accuracy.

The difference in the number of sampling points results in the 16-point traverse having sampling points that are closer to the stack walls (2.94” versus 4.05”) and center of the stack (29.72” versus 27.23”, with the stack center at 46”). A typical velocity flow profile

would be expected to be the lowest along the stack or duct walls, and generally the highest toward the center of the stack or duct. Thus, it is quite possible that a greater number of traverse points would lead to a larger overall observed range in differential pressures across the measurement plane.

Also, based upon physical measurements of the CEMS probe relative to the mounting flange, the mounting flange port length and the 45° installation angle, it has been calculated that the current flow CEMS measurement path is between approximately 4.6" and 12.0" when measured perpendicular to the stack wall. Thus, alignment between the flow CEMS readings and reference method measurements is likely sensitive to variations in the velocity profile across the measurement plane.

When comparing the 2020 and 2021 flow RATA reference method (RM) data, overall measured RM flow was higher in the 2021 RATA at the High operating level, and the overall range in differential pressures was also higher during the 2021 High operating level RATA. At the Low operating level (note that the Mid operating level was only assessed in the 2021 RATA), the overall measured RM flow was slightly higher in the 2020 RATA, but the range in differential pressures was higher in the 2021 RATA.

Tables 2.2 and 2.3 present a summary of calculated velocities across the various traverse points at the High and Low operating levels, respectively. For each of the 2020 and 2021 RATAs, the tables present the average velocity for each test run, as well as the minimum and maximum velocities observed across the various traverse points. In parenthesis within the tables, the percentage difference between the minimum and maximum traverse point velocities as compared to the overall average velocity are also presented, and the average steam flow for each RATA is also presented at the top of the tables.

We believe that the flow CEMS probe measurement path relative to the stack wall and the 2021 velocity profiles explain why the 2021 RATAs resulted in the need for a K-factor while the preceding flow RATA did not. For the 2021 flow RATAs, the flow profile showed a sizeable gradient with lowest velocities along the stack wall and highest velocities toward the center of the stack. Specifically, the minimum observed velocities were around 18.9% to 22.0% lower than the average velocity, while the maximum velocities were 11.6% to 13.0% higher than the average velocity. In contrast, the 2020 RATA showed minimum observed velocities were around 3.6% to 5.5% lower than the average velocity, while the maximum velocities were 3.8% to 4.7% higher than the average velocity.

During the 2021 RATAs, it was also noted that the observed velocities and calculated flow rates at sampling points in closest proximity to the flow CEMS measurement path generally aligned well with the unadjusted raw flow measurement. Within the 2021 RATA test report, Port 1 corresponded to the southwest (SW) test port, while Port 2 corresponded to the southeast (SE) test port (See Figure 2-1). The flow CEMS probe is located nearest the SW test port. The lowest velocities were consistently observed for traverse point 8, which corresponds to the sampling points nearest the SW and SE test ports (traverse point 1 was all the way into the stack, near the opposing NE and NW test ports). The highest velocities were consistently observed at traverse points 3 and 4, which were on the opposite side of the stack relative to the flow monitor probe position.

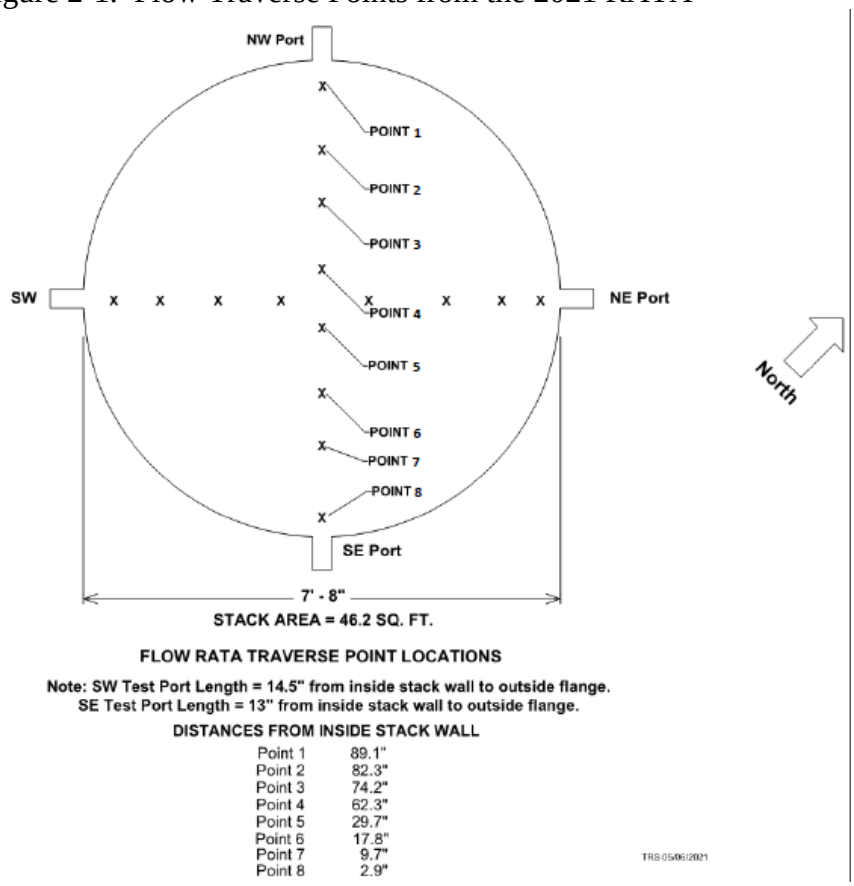
Table 2.2. 2020 and 2021 Traverse Point Velocity Values at High Load

Run No.	2020 Flow RATA Results (ft/sec) [302 klbs/hr]					2021 Flow RATA Results (ft/sec) [307 klbs/hr]				
	Average	Minimum		Maximum		Average	Minimum		Maximum	
1	72.43	69.12	(4.57%)	74.47	(2.81%)	78.14	57.99	(25.79%)	88.15	(12.81%)
2	73.04	69.55	(4.78%)	77.71	(6.40%)	78.69	62.15	(21.02%)	88.76	(12.79%)
3	72.42	70.22	(3.04%)	74.48	(2.84%)	77.94	58.62	(24.80%)	88.01	(12.92%)
4	72.40	70.19	(3.05%)	76.13	(5.14%)	78.73	65.18	(17.21%)	90.37	(14.78%)
5	72.28	69.55	(3.77%)	74.59	(3.19%)	77.64	58.83	(24.23%)	88.90	(14.50%)
6	72.23	70.26	(2.72%)	74.66	(3.37%)	79.68	65.14	(18.25%)	88.39	(10.93%)
7	72.14	69.66	(3.44%)	74.66	(3.49%)	80.13	63.83	(20.35%)	90.07	(12.40%)
8	72.47	70.38	(2.88%)	74.75	(3.14%)	79.77	63.51	(20.38%)	89.80	(12.57%)
9	71.91	69.29	(3.65%)	74.73	(3.92%)	78.62	61.44	(21.85%)	88.09	(12.04%)
10	NA	NA		NA		79.18	61.00	(22.97%)	90.24	(13.97%)
11	NA	NA		NA		79.41	61.84	(22.13%)	89.16	(12.27%)
12	NA	NA		NA		78.81	59.17	(24.92%)	89.42	(13.46%)

Table 2.3. 2020 and 2021 Traverse Point Velocity Values at Low Load

Run No.	2020 Flow RATA Results (ft/sec) [165 klbs/hr]					2021 Flow RATA Results (ft/sec) [126 klbs/hr]				
	Average	Minimum		Maximum		Average	Minimum		Maximum	
1	49.62	47.58	(4.11%)	51.87	(4.53%)	44.39	35.01	(21.13%)	50.45	(13.67%)
2	49.73	47.01	(5.47%)	52.26	(5.10%)	44.61	37.40	(16.16%)	48.57	(8.88%)
3	48.67	45.83	(5.84%)	51.30	(5.41%)	43.91	34.13	(22.27%)	48.37	(10.15%)
4	47.89	44.91	(6.23%)	49.93	(4.28%)	44.33	37.06	(16.40%)	49.49	(11.62%)
5	47.55	44.82	(5.73%)	49.42	(3.94%)	44.09	34.61	(21.52%)	48.90	(10.89%)
6	47.71	45.32	(5.00%)	49.45	(3.66%)	43.68	35.33	(19.12%)	48.52	(11.09%)
7	47.41	44.79	(5.52%)	49.39	(4.18%)	43.40	36.06	(16.91%)	48.01	(10.63%)
8	46.48	43.73	(5.90%)	48.89	(5.20%)	43.51	34.77	(20.09%)	49.64	(14.10%)
9	46.25	43.68	(5.57%)	48.92	(5.78%)	43.76	34.52	(21.11%)	49.16	(12.34%)
10	NA	NA		NA		43.33	35.81	(17.35%)	48.90	(12.84%)
11	NA	NA		NA		43.13	35.60	(17.44%)	48.09	(11.52%)
12	NA	NA		NA		42.46	35.22	(17.05%)	47.49	(11.87%)

Figure 2-1. Flow Traverse Points from the 2021 RATA



While there has not been an opportunity to review the 2017 – 2019 flow RATA results to the same level of detail as that applied to the 2020 and 2021 flow RATAs herein, it is suspected that a flatter velocity profile and the differences in sampling points (note that 12 traverse points were consistently used through the 2017-2019 flow RATAs) contributed to the lack of a K-factor in these years.

EGLE: Subsequently, the monitor failed trial RATAs at all three loads again [sic[1]] in Apr 2021.

Response: The plant did fail three, 3-run RATA trials at the low, high, and mid loads in April 2021 for a cold "hands off" trial prior to the official RATA attempt. The plant corrected the problem in accordance with Appendix B of Part 75, as EPA recognizes that calibration, or re-linearization, of a flow monitor may be necessary to ensure continued alignment with the RM. Provisions for this adjustment after trial RATA runs are contained in the Part 75 regulations as follows:

[1] We assume this is in reference to EGLE's "RATA like" analysis based on the ROP stack test data; however, as discussed herein, this is not a RATA under 40 CFR Part 75.

Part 75, Appendix B, 2.3.2
(b)(2) The RATA may be done after performing only the routine or non-routine calibration adjustments described in section 2.1.3 of this appendix at the zero and/or upscale calibration gas levels, but no other corrective maintenance, repair, re-linearization or reprogramming of the monitoring system. Trial RATA runs may be performed after the calibration adjustments and additional adjustments within the allowable limits in section 2.1.3 of this appendix may be made prior to the RATA, as necessary, to optimize the performance of the CEMS. The trial RATA runs need not be reported, provided that they meet the specification for trial RATA runs in §75.20(b)(3)(vii)(E)(2). However, if, for any trial run, the specification in §75.20(b)(3)(vii)(E)(2) is not met, the trial run shall be counted as an aborted RATA attempt.

In Part 75, Appendix B, EPA also provides for how to conduct the RATA and account for downtime when a re-linearization (K-factor adjustment) is required:

(f) For a 2-level or 3-level flow RATA, if, at any load level (or operating level), a RATA is failed or aborted due to a problem with the flow monitor, the RATA at that load level (or operating level) must be repeated. The flow monitor is considered out-of-control and data from the monitor are invalidated from the hour in which the test is failed or aborted and remain invalid until the passing of a RATA at the failed load level (or operating level), unless the option in paragraph (b)(3) of this section to use the data validation procedures and associated timelines in §75.20(b)(3)(ii) through (b)(3)(ix) has been selected, in which case the beginning and end of the out-of-control period shall be determined in accordance with §75.20(b)(3)(vii)(A) and (B). Flow RATA(s) that were previously passed at the other load level(s) (or operating level(s)) do not have to be repeated unless the flow monitor must be re-linearized following the failed or aborted test. If the flow monitor is re-linearized, a subsequent 3-load (or 3-level) RATA is required, except as otherwise provided in section 2.3.1.3(c)(5) of this appendix.

GGS did adjust the K-factor from 1.00 to 1.25. There is no regulatory threshold for discrediting a previous RATA upon changing the K-factor in this manner. GGS also changed a pressure setting from a default of 29.92" Hg to a value of 28.52" Hg as observed during trial flow RATA runs (this value is used in conversion to standard conditions), and the flow CEMS stack diameter setting from 94" to 92" as a correction for as-built versus stack design based upon physical measurements. It should be noted that all previous RATAs utilized a stack diameter of 92" for the cross-sectional area to be utilized in RM exhaust flow calculations.

The historic diameter of 94" and default stack pressure from 29.92" Hg can be thought of as resulting in a de facto historic K-factor. Specifically, the flow CEMS was historically programmed with a stack diameter of 94", equating to an area of 48.193 ft^2 (the 06/18/21 VN states the area was 49.19 ft^2, but this is believed to be an error). At the measured diameter of 92", the stack area is 46.167 ft^2. Thus, the historic stack area programmed into the flow CEMS was resulting in a consistent positive bias of 4.4% [48.193 ft^2 / 46.164 ft^2] (e.g., the equivalent of a K-factor of 1.044).

The flow CEMS measures flow on a wet actual basis, and the data is corrected to standard conditions based upon the following formula:

$$Flow_{Standard} = Flow_{Actual} \times \left[\frac{P_{Actual}}{P_{Ref}} \times \frac{T_{Ref}}{T_{Actual}}\right]$$

In a similar manner, leaving the historic flow CEMS pressure used for correction to standard conditions at 29.92" Hg was also biasing the flow high, as the pressure correction term based upon the 2021 RATA measurements was 0.953 [28.52" Hg/29.92" Hg].

When RCTS worked with GGS to update the flow CEMS programming to include the measured stack diameter of 92" and the actual stack pressure of 28.52" Hg (the 06/18/21 VN states the stack pressure was decreased from 2.12 lb/ft^2 to 2.04 lb/ft^2, but this may be in error or perhaps the units of measure are incorrect), the de facto historic K-factors were eliminated, and the CEMS flow readings decreased even further relative to RM. In part, it is suspected that this contributed to the apparent sizeable shift in the final K-factor of 1.25 (from 1.00).

Once the stack diameter and default pressure in the flow CEMS were updated, and the K-factor was set at 1.25, a probationary calibration was conducted, followed by a passing 3-load flow RATA. The DAHS was adjusted to report proper downtime prospective from the failed trial RATAs until completion of the probationary calibration, for a total of 71 hours which was reported in the second quarter excess emissions and monitoring downtime report.

EGLE: We were told the probe's location has not changed since the installation of the monitor. Rather than physically moving the probe, the K factor was changed to de facto move the probe by pro-rating the readings to what a representative location would read. We were also told the K factor had not been changed since install until shortly after the failed trial RATAs in Apr 2021.

Response: The statement that the location of the monitor has not changed since installation in 2017 is correct. The purpose of the K-factor is to allow changes to the flow monitor response to better align with reference method values as part of the ongoing required calibration and maintenance of a flow system (as explained above). The K-factor was not changed from the vendor factory settings during the 2017 installation because the RATA results did not indicate that a change to this setting was required, as relative accuracy results at all three loads were below 10%, thus passing the required test tolerance. EPA has stated that a RATA test is the "gold standard" and Part 75, Appendix A, Section 1.2.1 stipulates that proper location of a monitoring system is valid if all performance criteria is met. Further discussion on this topic is presented in Section 2.1.

EGLE: Given the facts that the probe location and K factor were not changed between Oct 2017 and Apr 2021, and this location and K factor proved to be incorrect using RATAs from two different contractors several months apart, the flow data appears to be invalid during this time period.

Response: The statement above is a potential outcome from examining the data but certainly not a definitive conclusion, as there are other plausible conclusions which we believe are more likely. First off, the 2020 and 2021 flow RATAs, conducted using RMs as specified in 40 CFR Part 75, were both passed. Passing these RATAs is indicative of valid flow data. The only Part 75 RATA that failed was the 3-load, 3-run trials that were conducted in April 2021 prior to adjusting the K-factor. GGS agrees that the data comparison that EGLE compiled from the November 2020 test events raised a flag for further investigation; however, that comparison does not constitute a failed RATA under Part 75. If creed is given to this type of comparison, then every stack test that includes flow rate is potentially subject to this type of scrutiny even though test run times and reference methods are not the same as stipulated in an actual flow RATA conducted in accordance with Part 75. There is no regulatory evidence to extend the failed trial RATAs back to the 2017 installation.

The above conclusion drawn by EGLE appears to assume that K-factors (or other flow monitor mathematical adjustments) inherently remain stable over time. Our experience and data presented later indicate that this is not always true. Although there was no specific allegation that the level of the K-factor in and of itself is indicative of an issue with the flow monitor, recent interaction with EGLE seems to suggest that the agency views the level of the recent K-factor as further proof that the flow monitor location is not acceptable.

Flow monitors often have a means of mathematically adjusting the raw output from the monitor to better align with reference method flow data. These adjustments can take various forms, including K-factors (simple multiplier), Look Up Tables (specific linear equations based upon comparisons at multiple flow velocities) and Polynomial equations. The specific mathematical adjustment technique is specific to each individual make and model of flow monitor, with some flow monitors offering multiple options.

Neither Consumers Energy (CE) nor CMS Enterprises owned facilities have historically tracked the K-factors/mathematical adjustments and related changes over time. Based upon a limited review of other CE/CMS sites and ultrasonic flow monitor comparisons between raw flow CEMS and RM measurements, a K-factor of 1.25 does not seem outlandish. Further, the limited review suggests that sizeable increases in flow monitor adjustment factors over time can occur and are not indicative of improper operation of the flow monitor or installation of the flow monitor in a location which is inherently unrepresentative.

For example, as a trial case, the mathematical adjustments for the Teledyne Model 150 ultrasonic flow monitors at JH Campbell Unit 3 (JHC 3) were reviewed. The flow CEMS for JHC 3 were installed at a new duct in 2016 and certified in accordance with 40 CFR Part 75. The Teledyne Model Ultraflow 150 monitors at JHC 3 are true cross-duct measurements. They are two complete flow monitors that operate in tandem as the primary flow monitor, with each individual flow monitor serving as a redundant backup.

The linearization approach for the JHC3 Teledyne flow monitors is Look Up Table (LUT) coefficients. Under this approach, the relationship between raw flow CEMS measurements and the RM measurements are used to develop separate linear equations between zero to the Low operating level point, Low to Mid operating level points, and Mid to High

operating level points (note that this linear equation continues beyond the High operating level point). These linear equations are then used to adjust the raw flow CEMS measurements to ensure better alignment with the RM. Tables 2.4 and 2.5 present a summary of the original LUT measurements, as well as LUT measurements based upon 2021 flow RATA testing for JHC3, for each of the individual JHC 3 flow monitors, respectively. The 2021 LUT adjustments reflect the first change in such factors since original installation of the flow CEMS back in 2016.

Table 2.4. Summary of JHC 3 Flow Monitor LUT Values for Monitor Serial No. 1500470

Operating Level	LUT Values for 2016 Installation			LUT Values for 2021 Adjustments		
	Raw Flow CEMS Velocity (ft/sec)	RM Flow Velocity (ft/sec)	Ratio of RM to Raw Flow CEMS Velocity	Raw Flow CEMS Velocity (ft/sec)	RM Flow Velocity (ft/sec)	Ratio of RM to Raw Flow CEMS Velocity
High	56.767	57.775	1.018	52.767	63.473	1.203
Mid	41.967	45.850	1.093	40.267	48.887	1.214
Low	35.683	40.199	1.127	33.600	40.663	1.210

Table 2.5. Summary of JHC 3 Flow Monitor LUT Values for Monitor Serial No. 1500471

Operating Level	LUT Values for 2016 Installation			LUT Values for 2021 Adjustments		
	Raw Flow CEMS Velocity (ft/sec)	RM Flow Velocity (ft/sec)	Ratio of RM to Raw Flow CEMS Velocity	Raw Flow CEMS Velocity (ft/sec)	RM Flow Velocity (ft/sec)	Ratio of RM to Raw Flow CEMS Velocity
High	55.475	57.775	1.041	52.733	63.473	1.204
Mid	41.667	45.850	1.100	41.433	48.887	1.180
Low	34.167	40.199	1.177	35.200	40.663	1.155

As shown in Tables 2.4 and 2.5, the relationships observed from LUT measurements have varied over time relative to the original flow monitor installations back in 2016. Also, the ratio between the raw flow monitor readings and RM values have been up to 1.214. The variance in the JHC 3 LUT at the High operating level is comparable to the variance in the GGS K-Factor. The preceding comparisons are for true cross-duct measurement paths, not the much shorter measurement path employed at Grayling Generating Station.

Based upon a limited review (e.g., JHC 3 over the last 5 years) of ultrasonic flow monitor comparisons between raw flow CEMS and RM measurements, a K-factor of 1.25 does not seem outlandish. Further, the limited review suggests that sizeable increases in flow monitor adjustment factors over time can occur and are not indicative of improper

operation of the flow monitor or installation of the flow monitor in a location which is inherently unrepresentative.

The stability of the K-factor (or other mathematical adjustments) over time is in part addressed by the Flow-To-Load (FTL) Ratio or Gross Heat Rate (GHR) Evaluations required in Section 2.2.5 of 40 CFR Part 75, Appendix B. After each successful RATA, a FTL ratio or GHR reference value is established using the load and RM average flow and other values, as applicable. Each quarter thereafter, an FTL ratio or GHR is calculated on an hourly basis and the percentage difference from the FTL ratio or GHR reference value is determined. Then, the quarterly average difference between the FTL ratios or GHRs based upon the CEMS data and the FTL ratio or GHR reference value (based on RM data) is calculated, with prescribed tolerances in §2.2.5(b) of Appendix B. If there were a sustained shift in the flow CEMS readings relative to RM readings during the most recent RATA, this would be evident in failing quarterly FTL ratio of GHR evaluation results.

If the quarterly FTL ratio or GHR evaluation is failed, Part 75 requires that an investigation be performed within 14 unit operating days after the failed evaluation. Depending upon the results of the investigation, a normal load flow RATA is required if nothing is found to be wrong with the flow monitor (e.g., no repairs are made or adjustments to the K-factors).

In the case of GGS, the plant has consistently relied on the FTL ratio evaluation since the flow CEMS was replaced in October of 2017. The quarterly FTL ratio evaluations have yielded an average difference of 7.1%, with results ranging between 4.1% and 14.4%. GGS has used bias adjusted data for these evaluations, and loads during the RATAs used to derive the FTL ratio reference values has always been less than 500 klbs/hr. Thus, the applicable passage criterion is an average difference less than 15.0%.

While the November 2020 ROP test results and RATA results suggest a possibility of divergence between the RM and flow CEMS readings, there is nothing within the FTL ratio evaluation results to suggest such is a long-term phenomenon.

EGLE: [From a 07/28/2021 e-mail from J. Howe] With all this for the background, the reason for the Second Violation Notice was to communicate to GGS that they have failed to respond adequately as mentioned in item 1a[2] of the original extension request email sent I sent 6-29-21, since they <u>have not addressed the probe's incorrect positioning since install.</u>

Response: The statement above is the first time that EGLE questioned the "probe positioning". A review of the prior EGLE communication, through VNs or email, makes no mention of this concern. In addition, we don't recall this issue being raised verbally in our meetings leading up to the VN.

As stated in the 07/28/2021 email from J. Howe: "*<u>To my knowledge, the only QA check</u>*

[2] 1. Request to extend the VN response due date from 7-9-21 to 8-20-21.
a. GGS mentioned several factors on the 6-23-21 conference call that would make responding to the VN by 7-9-21 rather difficult. Given these factors, the extension to 7-21-21 seemed reasonable. The VN response will not require the full defense of GGS to the alleged violations, rather how you will respond to them. As such, please provide in the response what date the needed data and documentation will be supplied by and your position on the alleged violations.

that confirms correct probe location within the stack is a RATA." As previously stated, EGLE approved of the 2017 RATA and flow monitor recertification. We question why EGLE is doubting proper installation/positioning back in 2017 with no evidence of such, except a step change in the flow rate after the new installation. Surely subsequent RATAs would have shown a problem, which they did not.

It is important to note that it is very common to have a step-change in flow rate after a boiler outage when maintenance activities are completed that can impact air flow, such as cleaning air passages, de-slagging the boiler, and fixing air in-leakages. The next sections present information on flow monitor location and variations in flowrate.

2.1 Location of Flow Monitor

A new flow monitor was installed in 2017 as the plant was experiencing corrosion in the upward facing portion of the cross-stack model due to moisture condensation collecting in the probe. Vendor Sick Maihak (SICK) provided an alternative one probe configuration that faces downward (45° angle) and thus does not allow moisture to collect within the probe. The old probe type was a cross-stack guided radar, while the new probe is a short path (approx. 11" of measurement); however, both types are ultrasonic radar, measuring a flow path and are not point source measuring devices.

Figure 2-2.
Old Monitor, pre-October 2017

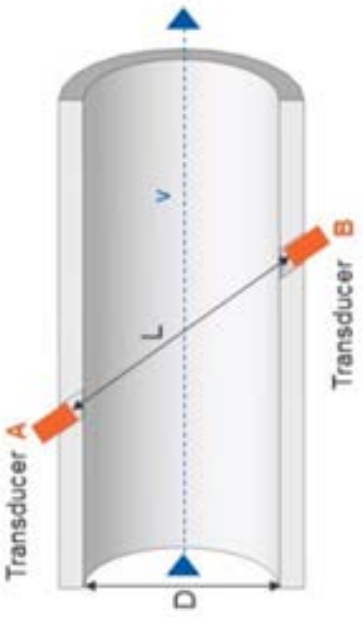


Figure 2-3.
New Monitor – 2017

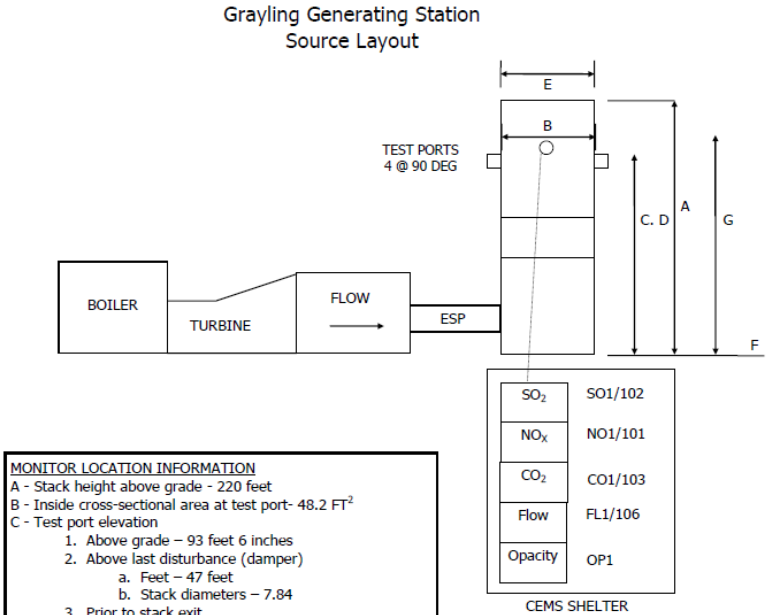
FLOWSIC100 PR
Ideal for one-sided installation with stack diameters from 1 m

The location of the flow monitor is shown in the Source Layout presented as Figure 2-4. As shown, the flow probe is located in a position that meets EPA Part 60, Appendix A, Method 1 citing criteria with reagrd to upstream and downstream disturbances. Also, the performance specification was met, as documented in the recertification submittal and

subsequent EGLE approval. With regard to the acceptability of flow CEMS siting, 40 CFR Part 75 states the following (underline emphasis added):

> Part 75, Appendix A:
> 1.2.1 Acceptability of Monitor Location
> The installation of a flow monitor is acceptable if either (1) the location satisfies the minimum siting criteria of method 1 in appendix A to part 60 of this chapter (i.e., the location is greater than or equal to eight stack or duct diameters downstream and two diameters upstream from a flow disturbance; or, if necessary, two stack or duct diameters downstream and one-half stack or duct diameter upstream from a flow disturbance), or (2) the results of a flow profile study, if performed, are acceptable (i.e., there are no cyclonic (or swirling) or stratified flow conditions), and the flow monitor also satisfies the performance specifications of this part. If the flow monitor is installed in a location that does not satisfy these physical criteria, but nevertheless the monitor achieves the performance specifications of this part, then the location is acceptable, notwithstanding the requirements of this section.

Figure 2-4. Source Layout, Monitoring Probe and Test Port Locations (Figure from the time of installation. Note that stack diameter is based on the 94" design)



MONITOR LOCATION INFORMATION
A - Stack height above grade - 220 feet
B - Inside cross-sectional area at test port- 48.2 FT^2
C - Test port elevation
1. Above grade – 93 feet 6 inches
2. Above last disturbance (damper)
   a. Feet – 47 feet
   b. Stack diameters – 7.84
3. Prior to stack exit
   a. Feet – 10 feet 11 inches
   b. Stack diameters – 7.84

D - CEMS (Flow, SO_2, NO_x, CO_2) sample probe elevation
1. Above grade – 93 feet 6 inches
2. Above last disturbance (damper)
   a. Feet – 47 feet
   b. Stack diameters – 7.84
3. Prior to stack exit
   a. Feet – 93 feet 6 inches
   b. Stack diameters – 7.84

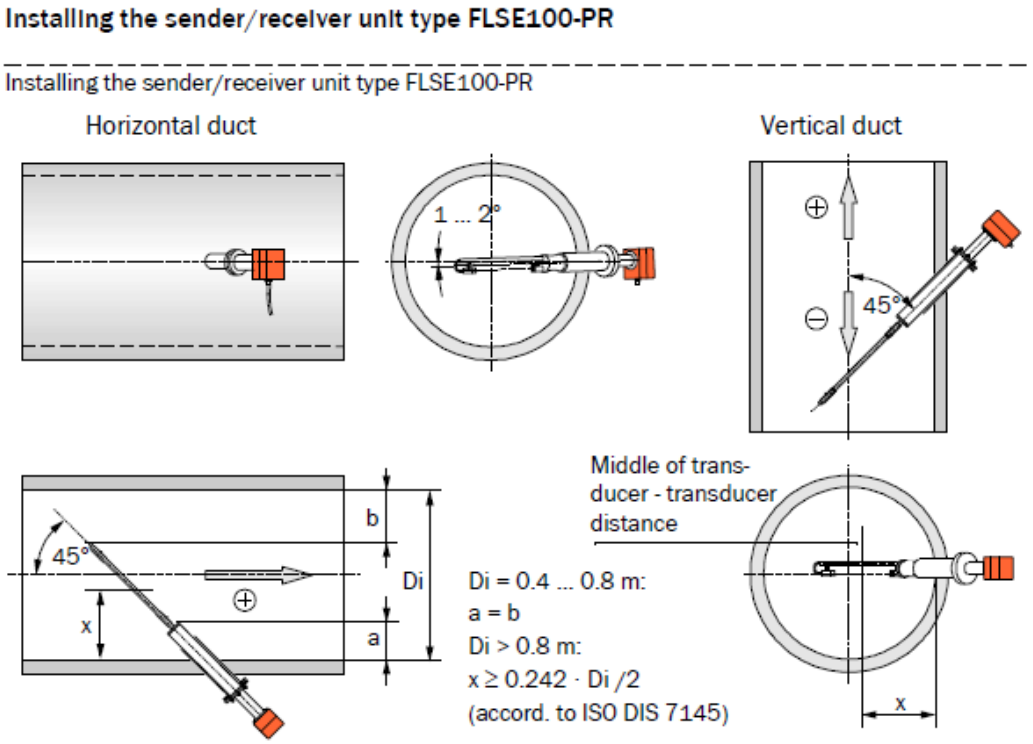
E - Inside cross-sectional area at flue exit – 48.2 ft^2
F - Stack base elevation–1250 feet above mean sea level
G - COMS (Opacity) monitor elevation
1. Above grade – 93 feet 6 inches
2. Above last disturbance (damper)
   a. Feet – 10 feet 11 inches
   b. Stack diameters – 7.84
3. Prior to stack exit
   a. Feet – 8 feet 6.25 inches
   b. Stack diameters – 7.8

Of specific note is the last sentence of the regulatory excerpt which plainly states, regardless of installation location, if the device meets performance specifications, then the monitor location is acceptable.

During an August 5, 2021 teleconference with the EPA, Mr. Charles Frushour stated that he thought Appendix A of Part 75 contained guidance for the siting of the sample path/location relative to the stack or duct wall. However, after having reviewed 40 CFR Part 75, Appendix A in detail, we conclude any provisions relating to the distance between the measurement point/path and the stack or duct walls only pertain to gas monitors, not flow monitors. Thus, we are not aware of any specific requirement for flow monitors regarding the distance between the measurement location and stack or duct walls.

Based upon physical measurements of the probe and test port during the 2021 RATA, the flow CEMS measurement path sits at approximately 4.6" to 12.0" into the stack perpendicular to the stack wall. Figure 2-5 is an excerpt from the SICK Operating Instructions for the flow monitor. Per SICK's written guidance, the distance between the center point of the flow measurement path and the stack wall in vertical configurations should be equal to 0.242 times the diameter divided by 2. For the GGS installation, the preceding equates to 11.1" from the stack wall [0.242*92"/2].

Figure 2-5. SICK Installation Guidance



x = representative wall clearance at which the local gas flow rate is the same as the mean velocity in the duct cross-section

Thus, the center point of the current measurement path, at an estimated 8.3" into the stack (perpendicular to the stack wall, the measurement path is estimated as 4.6" to 12.0"), is generally consistent with the recommendation from SICK. That being said, we do intend to monitor the stability of the FTL ratio evaluations and K-factors to better understand if there is a dynamic relationship between the CEMS flow values and reference method data.

It is our understanding that SICK offers the same model of flow CEMS with a probe that is 20 centimeters longer than the current probe. As such, the longer probe would be expected to result in a path center point that is 13.98" from the stack wall (the measurement path, perpendicular to the stack wall, would be at 10.2" to 17.6"). After reviewing this concept with SICK, we received an email reply from their technical engineering department which states:

"Response from engineer:

It does not matter where the location is of the probe as all flow devices have to be correlated with a test team. Only criteria is that we are off the inner wall (e.g., Consistent with the Installation Manual). *By design it is not supposed to go to the center of the process."*

2.2 Operational Impacts on Exhaust Flow

2.2.1 Air In-leakage Effects Upon Exhaust Flow

Regarding the apparent downward shift in exhaust gas flowrate after the flow monitor replacement in October of 2017, it is noted in the next section's evaluation of flow to load ratio charts that the plant attempted to reduce air in-leakage as part of the outage in which the flow monitor was installed. Boiler repairs of such nature can have an appreciable effect upon the exhaust gas flow rate. A recent example of changes in boiler exhaust gas flow rates after addressing boiler in-leakage was observed at TES Filer City Station Unit 2. Following a July 2020 outage, approximate exhaust gas flow rates fell from 127,500 SCFM to 105,200 SCFM. The decrease in TES Filer City Unit 2 exhaust gas flow rates was later confirmed by a Relative Accuracy Test Audit in August of 2020, as well as ongoing passage of flow-to-load ratio tests.

2.2.2 Changes in Excess Air Levels

Boilers generally follow a defined excess air (or oxygen) curve that varies with load, with higher levels of excess air needed at lower loads to help ensure complete combustion at less stable boiler operating conditions. Further, boiler operators can manually introduce offsets relative to the excess air curve to respond to various operational challenges, as well as real-time CEMS data (e.g., an operator may bias the excess air high if carbon monoxide emissions were higher than desired). Changes in excess air levels will affect boiler exhaust gas flow rates, with higher levels of excess air leading to increased exhaust flow and vice versa. Figure 2-6 presents monthly average CO_2 concentrations for those operating hours with valid data and operation in the low operating level (85-180 klbs/hr stream flow).

Figure 2-6 Monthly Average CO_2 Concentrations Versus Time at the Low Operating Level

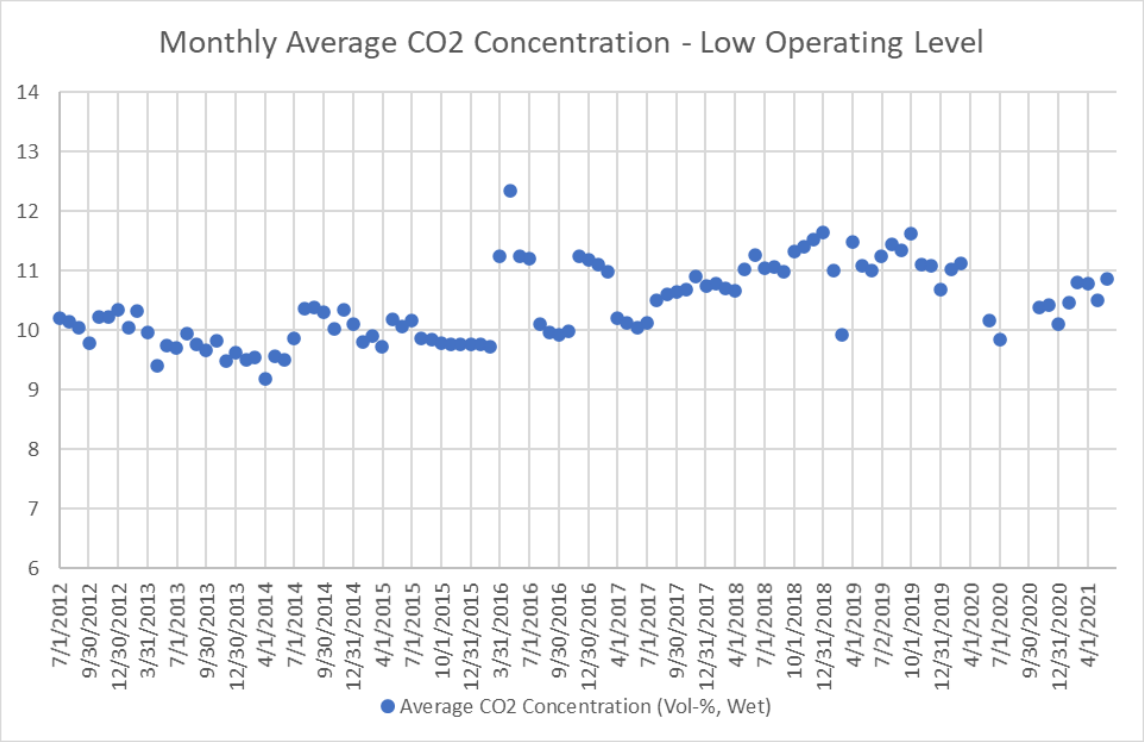
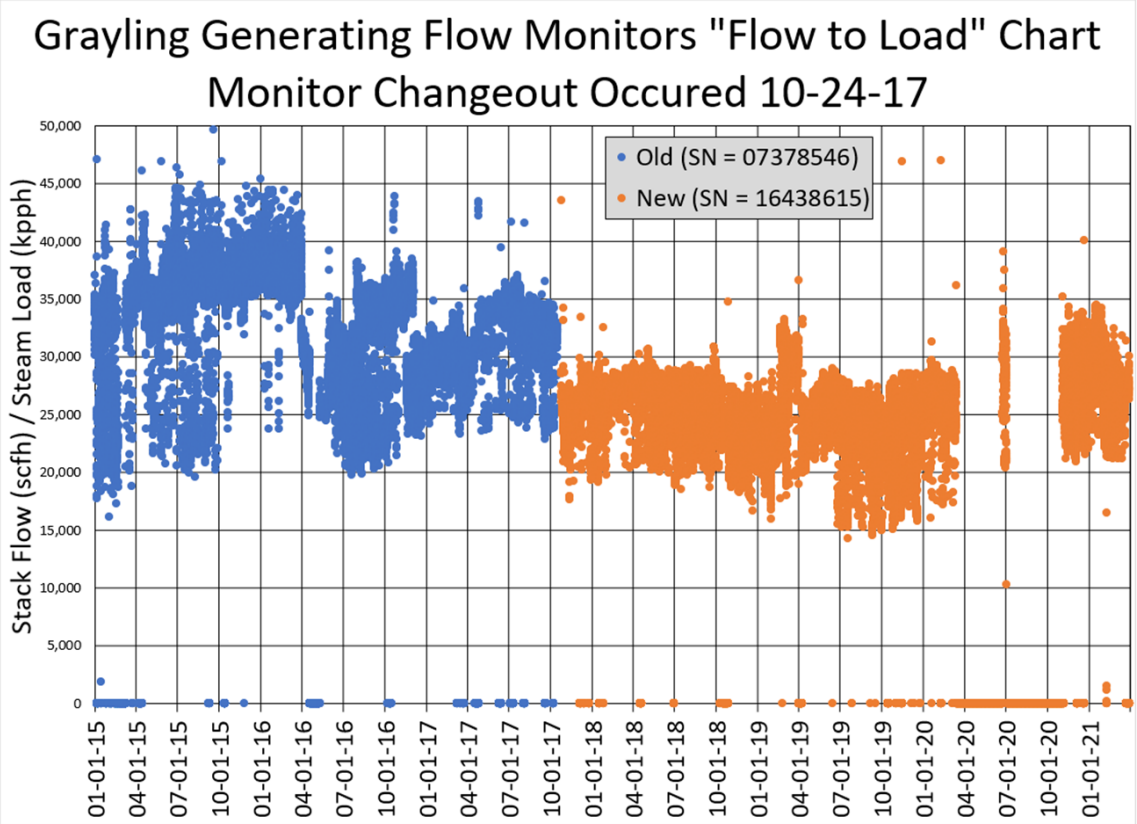


Figure 2-6 does show an upward trend in CO_2 concentrations in the last 5 years as compared to the previous five years. This would correlate to a reduction in boiler exhaust gas flow rates. It is not currently known if the trend in CO_2 concentrations is driven by operator induced changes in excess air levels, or a reduction in overall air in-leakage surrounding the 2017 outage in which the current flow CEMS was installed.

2.3 Evaluation of Flow Data Trends – Flow to Load Charts

As support of their assertion that something must be wrong with the Grayling flow CEMS, EGLE provided the "Flow to Load" chart for the period 01/01/2015 through 03/31/2021 within their June 18, 2021 Violation Notice. EGLE's discussion focused on the data before and after the 2017 flow monitor changeout, noting a divergence following the 2017 flow monitor changeout. To our knowledge, EGLE's Flow to Load chart, as shown in Figure 2-7 below, is based upon all available flow data, regardless of boiler operating level.

Figure 2-7. EGLE's "Flow to Load Chart" as contained in the VN



The preceding type of approach is contrary to EPA's own flow-to-load (FTL) quarterly quality assurance (QA) test in that there is no segregation of data based upon operating level. Likely in recognition that excess air levels can vary significantly across the operating range for a given unit (and thereby influence the relationship between exhaust flow rates and load), EPA's FTL test relies upon a baseline FTL record which is constructed following each successful flow RATA for each operating level (Low, Mid and High) designated as normal in the Part 75 monitoring plan. When assessing the FTL result at a given operating level, the EPA further excludes data in which the hourly average load differs by more than +/- 10% relative to the average load associated with the baseline value. The prescribed way to evaluate flow to load is by normalizing the data within a load bin, as the regulation cites in Part 75, Appendix B, 2.2.5(a)(4):

> (4) The owner or operator shall evaluate the calculated hourly flow-to-load ratios (or gross heat rates) as follows. A separate data analysis shall be performed for each primary and each redundant backup flow rate monitor used to record and report data during the quarter. Each analysis shall be based on a minimum of 168 acceptable recorded hourly average flow rates (i.e., at loads within ±10 percent of Lavg). When two RATA load levels are designated as normal, the analysis shall be performed at the higher load level, unless there are fewer than 168 acceptable data points available at that load level, in which case the analysis shall be performed at the lower load level. If, for a particular flow monitor, fewer than 168 acceptable hourly flow-to-load ratios (or GHR values) are available at any of the load levels

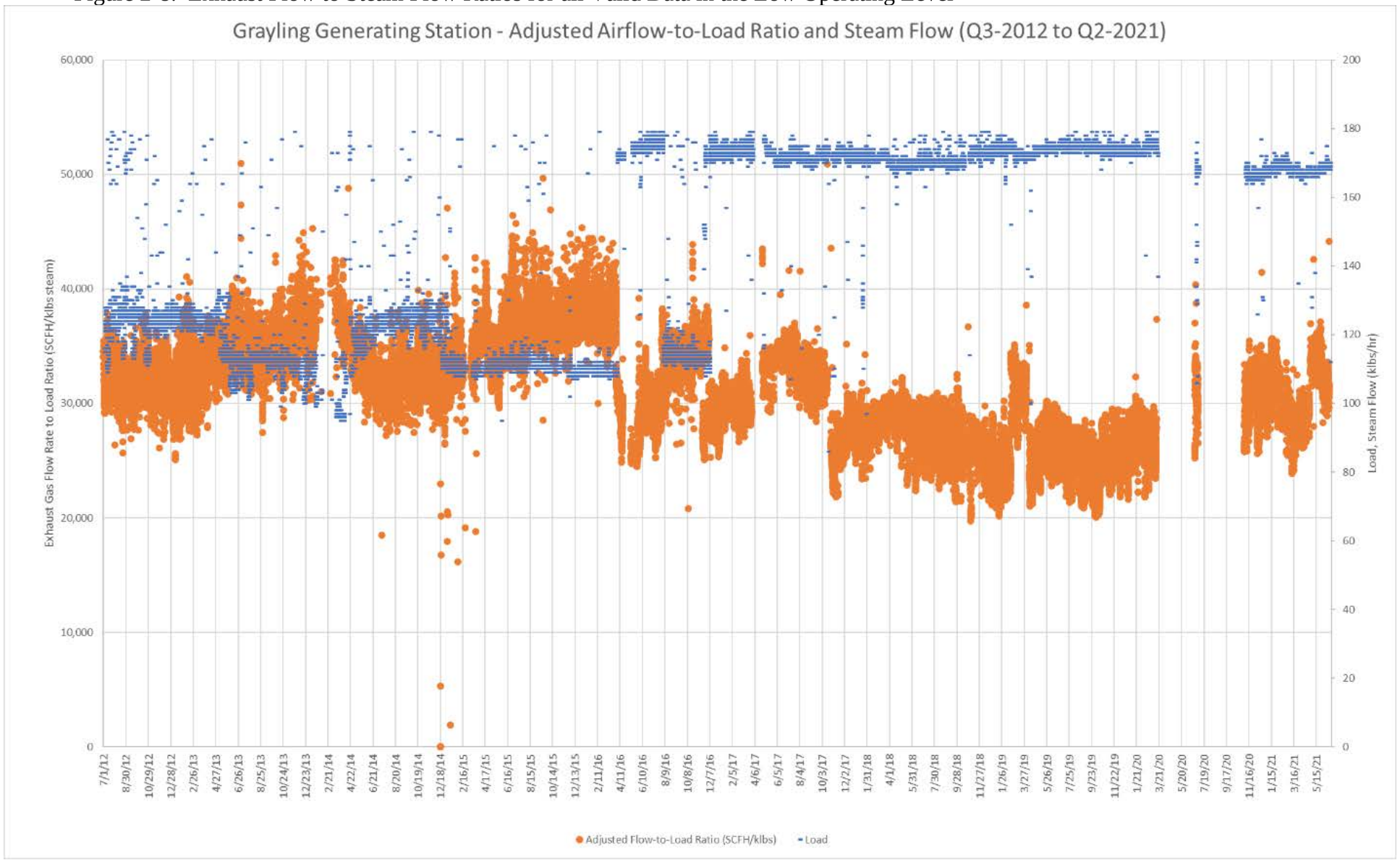
designated as normal, a flow-to-load (or GHR) evaluation is not required for that monitor for that calendar quarter.

Figure 2-8 presents flow-to-load ratios for the period 07/01/2012 through 06/30/2021 based upon all valid hourly flow data associated with the low operating level only, as that is the main operating mode for GGS. When the flow data is segregated by operating level, there is less variance in the resulting flow to load ratios as compared to the chart prepared by EGLE. Further, when the data set is extended further back in time (in this case, to 07/01/2012 as opposed to 01/01/2015), observe that the 2015 and 2016 flow to ratio ratios were generally higher than those in preceding years.

Also note that Figure 2-8 includes the boiler steam flow load data in addition to the flow-to-load ratios. This information provides important context; the data shows that the flow-to-load ratio decreases with increases in load and vice versa. The preceding follows the general concept of operating at higher levels of excess air as the boiler load decreases.

Over time, the typical loads associated with the low operating level have increased. Prior to the October 2017 flow monitor replacement, loads in the low operating level were often 100-125 klbs/hr; after this time, loads were often 165-175 klbs/hr. This steam load shift was due to an operational decision to move the "idle", low load set point to a higher level to elevate boiler back-end temperatures in an effort to minimize the amount of corrosion on boiler/heater tubes the plant was experiencing while operating at the lower set point. Thus, there is no inherent reason to think that the flow-to-load ratio would be entirely consistent before and after the October 2017 flow monitor replacement.

Figure 2-8. Exhaust Flow to Steam Flow Ratios for all Valid Data in the Low Operating Level



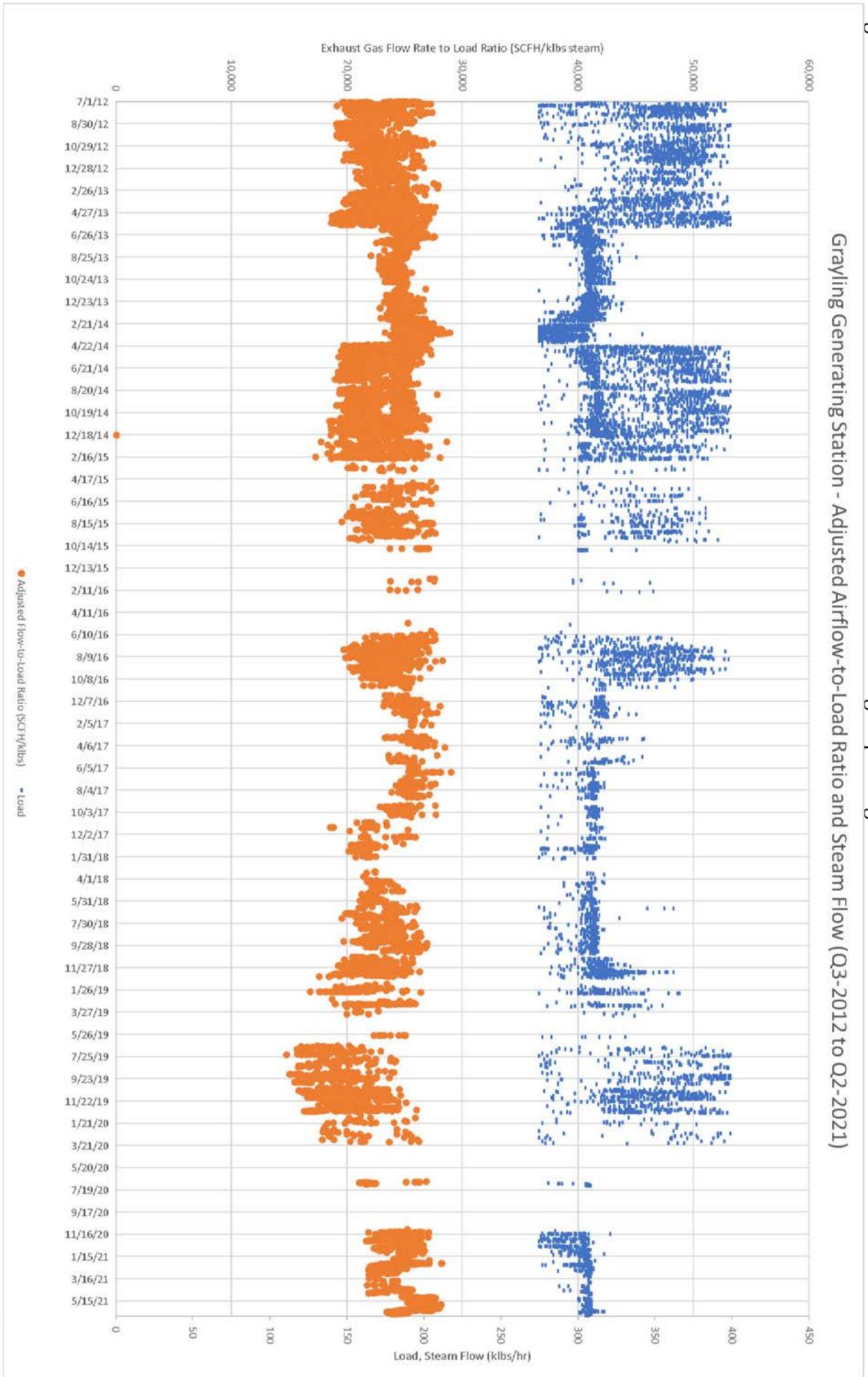
It is also noted that there were periods when boiler loads were approximately 175 klbs/hr between April and August of 2016 and December 2016 up to the October 2017 outage (i.e., before flow monitor replacement). The flow-to-load ratios during the preceding times are substantially lower than those observed for the January 2015 through March 2016 time period when typical boiler operating loads were in the 100-125 klbs/hr range. This strongly suggests that a large part of the "divergence" in flow-to-load ratios surrounding the 2017 flow monitor replacement are based upon changes to excess air levels at higher operating loads and/or a reduction in air in-leakage. Although plant records are not readily available that provide the exact detail of work that was conducted, plant personnel have attested that repair of air in-leakage from the primary air heater (which was also contributing to corrosion of the boiler tubes) took place during that fall 2017 outage, and this likely contributes to the lower flow values after the outage.

In 2020, after what was essentially an extended 7 month boiler outage, there was a step change in flow upon return to service due to fuel quality (fuel quality was poor after sitting in pile for 7 months – decomposing with higher moisture content). The plant had tried to start-up at the end of June 2020; however, the boiler tripped off-line again for an extended turbine repair, after which the annual RATA was conducted in November 2020. The 01/01/21 flow looks very similar to the time period of 1st quarter 2017, prior to the flow monitor change-out in October 2017. It is GGS's opinion that Figure 2-8 again shows how variable stack flow can be even at a "steady" normal load.

Please note that there are several locations in Figure 2-8 that show a "step change" in flow. These changes are likely more common to biomass fuel boilers due to inherent variability in fuel characteristics. In GGS's opinion, this figure also provides visual clarity on how variable flow can be in biomass type boilers across their load range, while balancing fuel quality (moisture, particle size, BTU content), which can have a significant impact on managing combustion air, as well as to highlight the operational shift previously discussed.

Figure 2-9 shows the GGS airflow to steam load ratio across the High load bin over the same time period, which we present to "round-out" this analysis. The variance in flow to load the ratios is again clearly present relative to operating loads, and there are periods pre- and post-flow CEMS replacement in 2017 which exhibit similar flow to load ratios.

Figure 2-9. Exhaust Flow to Steam Flow Ratios for all Valid Data in the High Operating Level



3.0 Summary Statement

GGS understands there are many complex factors contributing to this issue and our explanations of causes. GGS firmly believes our intense internal research of the historical data, as presented in this memorandum, provides the appropriate due diligence in addressing EGLE's initial assertions and on-going concerns. We have provided sound, principled, and plausible explanations for the flow anomaly observed in the November 2020 test event data and the 2017 flow change highlighted by EGLE in the violation notice.

Through our research we have concluded the following:

- Stack flow step changes can and do occur due to changes in excess air levels and outages in which air in-leakage is addressed.
- Adjustments to stack flow correlation factors (K-factor, look-up tables, etc.) are typical and allowed for and can be in the 20-25% range, with no regulatory threshold of adjustment.
- Changes to the stack diameter and pressure added to the magnitude of the K-factor adjustment in 2021, as the previous values were already biasing the flow data high.
- Measurement techniques and variations in reference methods can contribute to differences in flowrate calculations.
- Variations in flow-to-load ratios are relative to changes in operations and, when plotted according to the regulatory guidance, do not clearly indicate a problem.

Past circumstances cannot be re-created to understand the true root cause of the observed flow differences flagged by EGLE; rather, the cause could be a cumulative effect of the issues presented within this memorandum.

It is our goal to have a high degree of confidence in our emissions data, to use the regulatory tools provided to the best of our ability, and to maintain compliance at all times. We intend to do this while preserving a solid working relationship with EGLE based on logical and informed dialogue and technical understanding. The regulated community, as a whole, should be entitled to rely on historic passed tests as submitted to regulatory entities. GGS continues to calibrate, operate and maintain the flow CEMS to ensure the resulting data is accurate and complete, to the best of our ability.

Appendices

Appendix A
EGLE approval of 2017 re-certification RATA and flow monitor installation

Appendix B
RATA History Summary 2017-2021
EGLE observational field notes of 2018 and 2019 testing

Appendix C
EGLE email of July 28, 2021 from J. Howe

Appendix D
DAHS Reports from VIM

Appendix E
Timeline of Events

Appendix A

EGLE approval of 2017 re-certification RATA and flow monitor installation

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
CADILLAC DISTRICT OFFICE

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

April 9, 2018

Mr. Edward A. Going
Grayling Generating Station
4400 West Four Mile Road
Grayling, Michigan 49738

SRN: N2388, Crawford County

Dear Mr. Going:

SUBJECT: Flow Continuous Emission Monitor (CEM) Certification.

The Department of Environmental Quality (DEQ), Air Quality Division (AQD) has completed our review of the report for the new flow CEM at Grayling Generating Station located near Grayling, Crawford County, Michigan. This flow CEM is required by Renewable Operating Permit MI-ROP-N2388-2014a; Title 40 of the Code of Federal Regulations (40 CFR) Part 97, Subparts AAAAA, BBBBB and CCCCC.

The submitted report included results for 7-day Calibration Error Tests, Relative Accuracy Test Audits, and Bias Tests.

Testing was performed in accordance with 40 CFR Part 60, Appendix B, Performance Specification 6 and 40 CFR Part 75, Appendix A and B. All test results were acceptable.

The following CEMs met the requirements of 40 CFR, Part 60, Appendix B, Performance Specification 6 and Title 40 CFR, Part 75, Appendix A and B.

SOURCE	MAKE	MODEL	SERIAL NUMBER	MONITOR
EUBOILER	SICK	100-PR K17855SS	16438615	FLOW

If you have any questions regarding this letter, please contact me at the telephone number or email address listed below.

Sincerely,

Jeremy Howe
Environmental Quality Analyst
Air Quality Division
231-878-6687 / howej1@michigan.gov

cc/via email: Ms. Angeline Dunning, EPA
Ms. Karen Kajiya-Mills, DEQ
Mr. Shane Nixon, DEQ
Ms. Becky Radulski, DEQ

CEM

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
CADILLAC DISTRICT OFFICE

RICK SNYDER
GOVERNOR

C. HEIDI GRETHER
DIRECTOR

March 13, 2018

Mr. Robert Van Ells
Grayling Generating Station
4400 West Four Mile Road
Grayling, Michigan 49738

SRN: N2388, Crawford County

Dear Mr. Van Ells:

SUBJECT: Approval of Relative Accuracy Test Audit (RATA) report.

The Department of Environmental Quality (DEQ), Air Quality Division (AQD) has completed our review of the report for the Relative Accuracy Test Audits (RATAs) of the Continuous Emission Monitors (CEMs) at Grayling Generating Station located near Grayling, Crawford County. This protocol was received by the DEQ on September 7, 2017 and approved October 11, 2017. Testing was performed October 30 – November 1, 2017. The original report was received on December 12, 2017. The corrected report was received on March 7, 2018. These CEMs are required by Renewable Operating Permit MI-ROP-N2388-2014a; Title 40 of the Code of Federal Regulations (40 CFR), Part 60, Subpart Db; and 40 CFR, Part 97, Subparts AAAAA, BBBBB and CCCCC. Testing was performed in accordance with 40 CFR, Part 60, Appendix B, Performance Specification 2 and 40 CFR, Part 75, Appendixes A and B. The following CEMs passed RATA:

SOURCE	MAKE	MODEL	SERIAL NUMBER	MONITOR	RATA Units	DEQ RA	RATA Frequency	LOAD
EUBOILER	Thermo	48i	718622788	CO	CO lb/mmbtu	4*	Annual	Mid
	Thermo	410i	723423603	CO2				
	Thermo	42i	728324764	NOX	NOX lb/mmbtu	1.1	Annual	Mid
	Thermo	410i	723423603	CO2				
	Thermo	43i	723223532	SO2	SO2 lb/mmbtu	2*	Annual	Mid
	Thermo	410i	723423603	CO2				
	Thermo	43i	723223532	SO2	SO2 ppmvw	0.3**	Annual	Mid
	Thermo	410i	723423603	CO2	CO2 %vw	3.1	Annual	Mid
	SICK	100-PR K17855SS	16438615	FLOW	FLOW kscfh	2.9	Annual	High
	SICK	100-PR K17855SS	16438615	FLOW	FLOW kscfh	8.7	Semi Annual	Mid
	SICK	100-PR K17855SS	16438615	FLOW	FLOW kscfh	5.7	Annual	Low

RATA

Appendix
*using the emission limit in RA calculation
**using the criteria of 12.0 ppm absolute difference
RA = Relative Accuracy
CO = Carbon Monoxide
NOX = Nitrogen Oxides
SO2 = Sulfur Dioxide
CO2 = Carbon Dioxide
ppmvw = parts per million by volume, wet basis
%vw = percent by volume, wet basis
lb/mmbtu = pounds per million british thermal units
kscfh = thousand standard cubic feet per hour, wet basis

Please note the Flow RATA at Mid Load met the requirements for Semi Annual testing frequency, but not for Annual testing frequency. Therefore, the next Mid Load Flow RATA will be due before third quarter 2018.

Please continue to submit your excess emission reports and summary reports. If you have any questions regarding this letter, please contact me at the telephone number or email address listed below.

Sincerely,

Jeremy Howe
Environmental Quality Analyst
Air Quality Division
231-878-6687 / howej1@michigan.gov

cc/via email: Ms. Angeline Dunning, EPA
Ms. Karen Kajiya-Mills, DEQ
Mr. Shane Nixon, DEQ
Ms. Becky Radulski, DEQ

Appendix B
RATA History Summary. 2017-2021
EGLE observational field notes of 2018 and 2019 testing

Grayling Generating Station
RATA Result History
2017-2021

2021 RATA (April-May)

	Avg Steam Load (klbs/hr):	126	
	Run	RM	CEM
Low Load (~12MW)	1	4,498	4,529
	2	4,527	4,525
	3	4,465	4,490
	4	4,515	4,451
	5	4,461	4,475
	6	4,451	4,366
	7	4,454	4,423
	8	4,424	4,367
	9	4,359	4,318
	Average	**4,462**	**4,438**
	RA %		**1.23%**
	BAF		**1.000**

	Avg Steam Load (klbs/hr):	221	
	Run	RM	CEM
Mid Load (~18MW)	1	6,191	6,180
	2	6,112	6,244
	3	6,245	6,291
	4	6,167	6,282
	5	6,191	6,064
	6	6,218	6,272
	7	6,253	6,346
	8	6,282	6,293
	9	6,348	6,352
	Average	**6,223**	**6,258**
	RA %		**1.52%**
	BAF		**1.000**

	Avg Steam Load (klbs/hr):	307	
	Run	RM	CEM
High Load (~36 MW)	1	7,651	7,437
	2	7,689	7,384
	3	7,607	7,376
	4	7,559	7,381
	5	7,737	7,471
	6	7,626	7,521
	7	7,681	7,527
	8	7,704	7,481
	9	7,649	7,437
	Average	**7,656**	**7,446**
	RA %		**3.31%**
	BAF		**1.028**

2020 RATA & ROP Stack Test (Nov.)

	Avg Steam Load (klbs/hr):	165	
	Run	RM	CEM
Low Load (~12MW)	1	5,184	5,126
	2	5,212	4,995
	3	5,109	4,860
	4	5,023	4,993
	5	4,988	4,712
	6	5,008	4,709
	7	4,973	4,791
	8	4,874	4,790
	9	4,852	4,700
	Average	**5,025**	**4,853**
	RA %		**4.92%**
	BAF		**1.035**

	Avg Steam Load (klbs/hr):	NA	
Mid Load (~18MW)			
High Load (~36 MW)			

	Avg Steam Load (klbs/hr):	302	
	Run	RM	CEM
High Load (~36 MW)	1	7,169	7,199
	2	7,228	7,101
	3	7,166	7,167
	4	7,160	6,968
	5	7,132	6,998
	6	7,120	6,886
	7	7,106	6,891
	8	7,127	7,058
	9	7,069	7,114
	Average	**7,142**	**7,042**
	RA %		**2.54%**
	BAF		**1.014**

2019 RATA (May)

	Avg Steam Load (klbs/hr):	175	
	Run	RM	CEM
Low Load (~12MW)	1	4,563	4,651
	2	4,645	4,663
	3	4,659	4,389
	4	4,626	4,664
	5	4,665	4,519
	6	4,626	4,590
	7	4,578	4,568
	8	4,577	4,612
	9	4,573	4,564
	Average	**4,613**	**4,580**
	RA %		**2.54%**
	BAF		**1.000**

	Avg Steam Load (klbs/hr):	NA	
Mid Load (~18MW)			
High Load (~36 MW)			

	Avg Steam Load (klbs/hr):	312	
	Run	RM	CEM
High Load (~36 MW)	1	7,295	7,176
	2	7,294	7,242
	3	7,207	7,233
	4	7,265	6,980
	5	7,226	6,979
	6	7,152	7,022
	7	7,108	6,908
	8	7,108	6,586
	9	6,957	6,490
	Average	**7,179**	**6,957**
	RA %	**RA %**	**5.04%**
	BAF	**BAF**	**1.032**

2018 RATA (May)

	Avg Steam Load (klbs/hr):	170	
	Run	RM	CEM
Low Load (~12MW)	1	4,469	4,401
	2	4,543	4,476
	3	4,491	4,444
	4	4,414	4,362
	5	4,371	4,346
	6	4,371	4,386
	7	4,368	4,357
	8	4,366	4,373
	9	4,399	4,397
	Average	**4,421**	**4,394**
	RA %		**1.18%**
	BAF		**1.006**

	Avg Steam Load (klbs/hr):	NA	
Mid Load (~18MW)			
High Load (~36 MW)			

	Avg Steam Load (klbs/hr):	311	
	Run	RM	CEM
High Load (~36 MW)	1	6,730	6,348
	2	6,679	6,312
	3	6,690	6,242
	4	6,656	6,286
	5	6,661	6,236
	6	6,615	6,224
	7	6,573	6,319
	8	6,588	6,301
	9	6,601	6,414
	Average	**6,644**	**6,298**
	RA %	**RA %**	**6.19%**
	BAF	**BAF**	**1.055**

2017 RATA (October-November)

	Avg Steam Load (klbs/hr):	108	
	Run	RM	CEM
Low Load (~12MW)	1	2,912	2,811
	2	2,801	2,830
	3	2,873	3,065
	4	2,881	2,993
	5	2,883	3,124
	6	2,898	3,034
	7	3,000	3,139
	8	3,055	3,100
	9	3,041	3,089
	Average	**2,927**	**3,021**
	RA %		**5.74%**
	BAF		**1.000**

	Avg Steam Load (klbs/hr):	183	
	Run	RM	CEM
Mid Load (~18MW)	1	6,988	6,171
	2	6,065	5,745
	3	6,011	5,741
	4	6,036	5,727
	5	4,963	5,159
	6	4,817	4,596
	7	4,926	4,566
	8	4,899	4,717
	9	4,896	4,662
	Average	**5,511**	**5,231**
	RA %		**8.70%**
	BAF		**1.053**

	Avg Steam Load (klbs/hr):	310	
	Run	RM	CEM
High Load (~36 MW)	1	6,999	6,752
	2	6,918	6,839
	3	6,922	6,865
	4	6,904	6,630
	5	6,905	6,647
	6	6,913	6,872
	7	6,861	6,838
	8	6,887	6,837
	9	6,883	6,825
	Average	**6,910**	**6,789**
	RA %	**RA %**	**2.92%**
	BAF	**BAF**	**1.018**

DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION
Field Observation Report: Stack Testing

Facility: GRAYLING GENERATING STATION LTD PTNR		**SRN / ID:** N2388
Location: GRAYLING	**County:** CRAWFORD	**District:** Gaylord

Permit(s): MI-ROP-N2388-2014a

Save

Contact (s):	Tim Porter - Facility	Staff (s):	Jeremy Howe - Cadillac	Date (s):	5/30/18
	Steve Byrd - Tester				
	Dave Engelhardt - Tester				

ACTIVITY:

☐ Pre-Test Site Visit/Monitoring	☑ Relative Accuracy Test Audit (RATA)
☐ Performance Specification Test (PST)	☐ COMS Performance Test Audit
☐ Cylinder Gas Audit (CGA)	☐ Visible Emissions Observation
☐ Photos Taken	☐ Other

This was RATA at Grayling Generating Station located near Grayling, Crawford County on May 30, 2018 for the following parameters:

Source	Subject to 40 CFR Part	Method[1]	Monitor	Monitor Unit	RATA Unit	PS[2]	Load[3]
EUBOILER	60, Appx B, F	10	CO	ppmvw	CO lb/mmbtu	4/4A	-
	60, Appx B, F	3A	CO2	%vw			
	60, Appx B, F	10	CO	ppmvw	CO lb/hr	6	-
	60, Appx B, F	1,2,3A,4	FLOW	scfh			
	75, Appx A, B	7E	NOX	ppmvw	NOX[4] lb/mmbtu	-	Low
	75, Appx A, B	3A	CO2	%vw			
	75, Appx A, B	6C	SO2	ppmvw	SO2 ppmvw	-	Low
	75, Appx A, B	3A	CO2	%vw	CO2 % vw	-	Low
	75, Appx A, B	1,2,3A,4	FLOW	scfh	FLOW scfh	-	Low
	75, Appx A, B	1,2,3A,4	FLOW	scfh	FLOW scfh	-	High

Appendix

[1]40 CFR Part 60, Appendix A
[2]Performance Specification in 40 CFR Part 60, Appendix B
[3]As defined in 40 CFR Part 75, Appendix A, Section 6.5.2.1(b)
[4]Alternatively, facility has option to RATA using NOX ppmvw
CO = Carbon Monoxide
CO2 = Carbon Dioixide
NOX = Nitrogen Oxides
SO2 = Sulfur Dioxide
ppmvw = parts per million by volume, wet basis
%vw = percent by volume, wet basis
scfh = standard cubic feet per hour, wet basis
lb/mmbtu = pounds per million british thermal units
lb/hr = pounds per hour

The following individuals were involved with the test:

DEQ
Jeremy Howe – Cadillac *231-878-6687 howej1@michigan.gov*

Stack Testers – Network
Dave – Gases
Steve – DGM/Flows
Rick – Stack

Facility
Tim Porter – EHS *timothy.porter@cmsenergy.com*

Items of note during testing:

- None observed

Observations:

Date = 5-30-18

This RATA went much more smoothly than the last one in 4th Quarter 2017. There were a lot of issues with getting the facility to run at the right load and this led to confusion and a mistake in the reporting.

I looked over Network's stuff and it all seemed in order. I took pictures of their field data sheets. Their results through 6 runs are summarized below.

NOX lb/mmbtu = 1.5 (limit 7.5)
SO2 lb/mmbtu = 9.7 (limit 20)
SO2 ppmvw = 1.7 average difference (12.0 limit for annual testing)
CO lb/mmbtu = 4.1 (limit 10)
CO lb/hr was not calculated onsite but will be in report (RM and CEM were both less than 10% of the emission limit, so they should be fine).
CO2 %vw = 1.5 (limit 7.5)
Mid Flow = 1.7 (limit 7.5)

Staff: Jeremy Howe CC: Date: 6/15/18

DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION
Field Observation Report: Stack Testing

Facility: GRAYLING GENERATING STATION LTD PTNR		**SRN / ID:** N2388
Location: GRAYLING	**County:** CRAWFORD	**District:** Gaylord

Permit(s):	MI-ROP-N2388-2014a				
Save					
Contact (s):	Ed Going - Facility	Staff (s):	Jeremy Howe - Cadillac	Date (s):	5/29/19
	Steve Byrd - Tester		Becky Radulski - Gaylord		
			Jodi Lindgren - Cadillac		

ACTIVITY:	
☐ Pre-Test Site Visit/Monitoring	☑ Relative Accuracy Test Audit (RATA)
☐ Performance Specification Test (PST)	☐ COMS Performance Test Audit
☐ Cylinder Gas Audit (CGA)	☐ Visible Emissions Observation
☐ Photos Taken	☐ Other

This was RATAs at Grayling Generating Station located near Grayling, Crawford County on May 29, 2019 for the following parameters:

Source	Subject to 40 CFR Part	Method[1]	Monitor	Monitor Unit	RATA Unit	PS[2]	Load[3]
EUBOILER	60, Appx B, F	10	CO	ppmvw	CO lb/mmbtu	4/4A	-
	60, Appx B, F	3A	CO2	%vw			
	60, Appx B, F	10	CO	ppmvw	CO lb/hr	6	-
	60, Appx B, F	1,2,3A,4	FLOW	kscfh			
	75, Appx A, B	7E	NOX	ppmvw	NOX[4] lb/mmbtu	-	Mid
	75, Appx A, B	3A	CO2	%vw			
	75, Appx A, B	6C	SO2	ppmvw	SO ppmvw	-	Mid
	75, Appx A, B	3A	CO2	%vw	CO2 % vw	-	Mid
	75, Appx A, B	1,2,3A,4	FLOW	kscfh	FLOW kscfh	-	Mid
	75, Appx A, B	1,2,3A,4	FLOW	kscfh	FLOW kscfh	-	High

[1]40 CFR Part 60, Appendix A
[2]Performance Specification in 40 CFR Part 60, Appendix B
[3]As defined in 40 CFR Part 75, Appendix A, Section 6.5.2.1(b)
[4]Alternatively, facility has option to RATA using NOX ppmvw
CO = Carbon Monoxide
CO2 = Carbon Dioixide
NOX = Nitrogen Oxides
SO2 = Sulfur Dioxide
ppmvw = parts per million by volume, wet basis
%vw = percent by volume, wet basis
kscfh = thousand standard cubic feet per hour, wet basis
lb/mmbtu = pounds per million british thermal units
lb/hr = pounds per hour

The following individuals were involved with the test:

EGLE
Jeremy Howe – Cadillac *231-878-6687 howej1@michigan.gov*
Becky Radulski – Gaylord 989-217-0051 *radulskir@michigan.gov*
Jodi Lindgren – Cadillac *231-942-2863 lindgrenj2@michigan.gov*

Stack Testers – Network *616-530-6330 netenviro@aol.com*
Steve Byrd – Flows
Dave Engelhardt – Gases
Rick Eerdmann – Stack

Facility
Chris Occhipinti – NTH Consultant *616-951-4774 cocchipinti@nthconsultants.com*
Makayla – NTH intern
Ed Going – Plant Manager

Items of note during testing:

- None observed

Observations:

Date = 5-29-19
Time onsite = 1330-1530

I stopped in to check on the RATAs. They appeared to be going ok. There was some difficulty in keeping the boiler steady at the high load flow RATA the night before, however it passed. I looked over the results through Run 6 on the normal load RATAs. These and the high load RATA results are summarized below using the RAs as provided by the testers.

Source	RATA Unit	RA	Limit	Runs
EUBOILER	CO lb/mmbtu	2	5	6
	CO lb/hr	1	10	6
	SO2 lb/mmbtu	2	10	6
	NOX lb/mmbtu	1.8	7.5	6
	SO ppmvw	0.4	12.0	6
	CO2 %vw	3.5	7.5	6
	FLOW Mid kscfh	3.3	7.5	6
	FLOW High kscfh	5.0	7.5	9

Staff: Jeremy Howe CC: Date: 6/26/19

Appendix C
EGLE email of July 28, 2021 from J. Howe

From:	Edward A. Going
To:	KATHRYN M. CUNNINGHAM
Subject:	FW: GGS voicemail follow-up
Date:	Thursday, July 29, 2021 2:34:28 PM
Attachments:	FW REVISED - Extension Request to EGLE_ltr.msg

From: Howe, Jeremy (EGLE) <HoweJ1@michigan.gov>
Sent: Wednesday, July 28, 2021 5:24 PM
To: KATHRYN M. CUNNINGHAM <KATHRYN.CUNNINGHAM@cmsenergy.com>; Edward A. Going <Edward.Going@cmsenergy.com>
Cc: Dolehanty, Mary Ann (EGLE) <DOLEHANTYM@michigan.gov>; Olaguer, Jay (EGLE) <OlaguerJ@michigan.gov>; Camilleri, Jenine (EGLE) <CamilleriJ@michigan.gov>; Ethridge, Christopher (EGLE) <ETHRIDGEC@michigan.gov>; Nixon, Shane (EGLE) <NIXONS@michigan.gov>; Kajiya-Mills, Karen (EGLE) <KAJIYA-MILLSK@michigan.gov>; Radulski, Rebbecca (EGLE) <RADULSKIR@michigan.gov>
Subject: GGS voicemail follow-up

Hi Kathryn. In response to your voicemail, I have the following below.

After reading the initial response, AQD maintains the stance that GGS needs to reassess the flow monitor's downtime. To my knowledge, the only QA check that confirms correct probe location within the stack is a RATA. The monitor failed a RATA using the flows from the nine stack test runs in Nov 2020. Subsequently, the monitor failed trial RATAs at all three loads again in Apr 2021. We were told the probe's location has not changed since the installation of the monitor. Rather than physically moving the probe, the K factor was changed to de facto move the probe by pro-rating the readings to what a representative location would read. We were also told the K factor had not been changed since install until shortly after the failed trial RATAs in Apr 2021.

Given the facts that the probe location and K factor were not changed between Oct 2017 and Apr 2021, and this location and K factor proved to be incorrect using RATAs from two different contractors several months apart, the flow data appears to be invalid during this time period.

With all this for the background, the reason for the Second Violation Notice was to communicate to GGS that they have failed to respond adequately as mentioned in item 1 a of the original extension request email sent I sent 6-29-21, since they have not addressed the

probe’s incorrect positioning since install.

Jeremy Howe
Environmental Quality Analyst
Air Quality Division / Cadillac District Office
Michigan Department of Environment, Great Lakes, and Energy
231-878-6687 | howej1@michigan.gov
Follow Us [gcc01.safelinks.protection.outlook.com] | **Michigan.gov/EGLE** [gcc01.safelinks.protection.outlook.com]

Appendix D
DAHS Reports from VIM

VIM TECHNOLOGIES
6960 Aviation Blvd., Suite G, Glen Burnie, MD 21061 • (410) 859-5455 • FAX (410) 859-5457

Technical Memo

To: Tim Porter

From: Ashley Partington

Date: January 17, 2018

Re: Grayling Generating Station – 2017-Q4 COMPAS Evaluation

Summary of Status and Recommendations

1. **QA Operating Hour Summary**:
   - Unit 1 has operated for 1925 hours.

2. **QA Test Status** (see attached QA Status Report for details)
   - Linearity Tests were completed this quarter.
   - RATA tests were completed this quarter.
   - A 3-load Flow RATA was performed in 2017-Q4. The next 3-load RATA will be due 2022-Q4.
   - The Flow-To-Load Check error (Ef) is 11.1% on the mid-level.
   - All other QA Testing is up to date.

3. **Analyzer Replacements:**
   - The new flow monitor was installed on 10/24 hour 15.
   - **Unit 1 Flow Monitor (Sick 100-PR K17855SS)**
     - Flow monitor serial number: 16438615
     - Probationary calibration: 10/26/2017
     - 7-day calibration error test: 10/16/2017 – 11/1 (7 days)
     - RATA: 10/30(mid), 10/31(high), and 11/1(low) (3 load)

4. **Protocol Gas Verification Program (PGVP) data**:
   - No discrepancies with PGVP data were detected.

5. **CO_2 Control Chart**:
   - The CO_2 data indicates the sampling system is properly functioning.

6. **Backup Status:**
   - The backup was successfully completed.

7. **Summary of Significant Edits:**

Unit	Start Date	-Hr	End Date	-Hr	Parameter(s)	Reason
Unit 1	12/25/2017	4	12/25/2017	6	FLOWSCFH	Invalid due to sample malfunction

If you have any questions regarding this report, please feel free to contact me.

Company: **GRAYLING** Location: **GENERATING STATION** ORIS Code: **10822** Report Date: **01/17/18**

Unit: **1**

Operational History											
Year-Qtr	Op Hours	Year-Qtr	Op Hours	Year-Qtr	Op Hours	Year-Qtr	Op Hours	Year-Qtr	Op Hours	Year-Qtr	Op Hours
		2013-Q1	2160	2014-Q1	2136	2015-Q1	2159	2016-Q1	2184	2017-Q1	973
		2013-Q2	2044	2014-Q2	1957	2015-Q2	2025	2016-Q2	1678	2017-Q2	1919
		2013-Q3	2208	2014-Q3	2202	2015-Q3	2193	2016-Q3	2208	2017-Q3	2074
		2013-Q4	2160	2014-Q4	2163	2015-Q4	2140	2016-Q4	2136	2017-Q4	1925

System/Component ID:	SO1	FL1	FL1	101	102	103				
QA Test:	**RATA**	**F2LREF**	**F2LCHK**	**LINE**	**LINE**	**LINE**				
Date of Last Test:	**10/31/2017**	**10/30/2017**	**12/31/2017**	**12/28/2017**	**12/28/2017**	**12/28/2017**				
Year-Qtr of Last Test:	2017-Q4	2017-Q4	2017-Q4	2017-Q4	2017-Q4	2017-Q4				
Limit in Operating Quarters:	4 (QA)	4 (QA)	1 (QA)	1 (QA)	1 (QA)	1 (QA)				
Due Date Based on Op Quarters:	12/31/2018	12/31/2018	03/31/2018	03/31/2018	03/31/2018	03/31/2018				
Limit in Calendar Quarters	8	8	NA	4	4	4				
Due Date Based on Cal Quarters:	12/31/2019	12/31/2019	NA	12/31/2018	12/31/2018	12/31/2018				
Allowable Grace Perod:	720 (hrs)	720 (hrs)	NONE	168 (hrs)	168 (hrs)	168 (hrs)				
Grace period Used:	0	0	NA	0	0	0				

RATA = Relative Accuracy Test Audit
LINE = Linearity Test Audit
FFACCTT = Fuel Flow Transmitter Accuracy Test
PEI = Primary Element Inspection

LEAK = Leak Check
F2LREF = Flow-To-Load Reference Test
F2LBAS = Flow-To-Load Baseline Test
(G) = Grace Period indicator

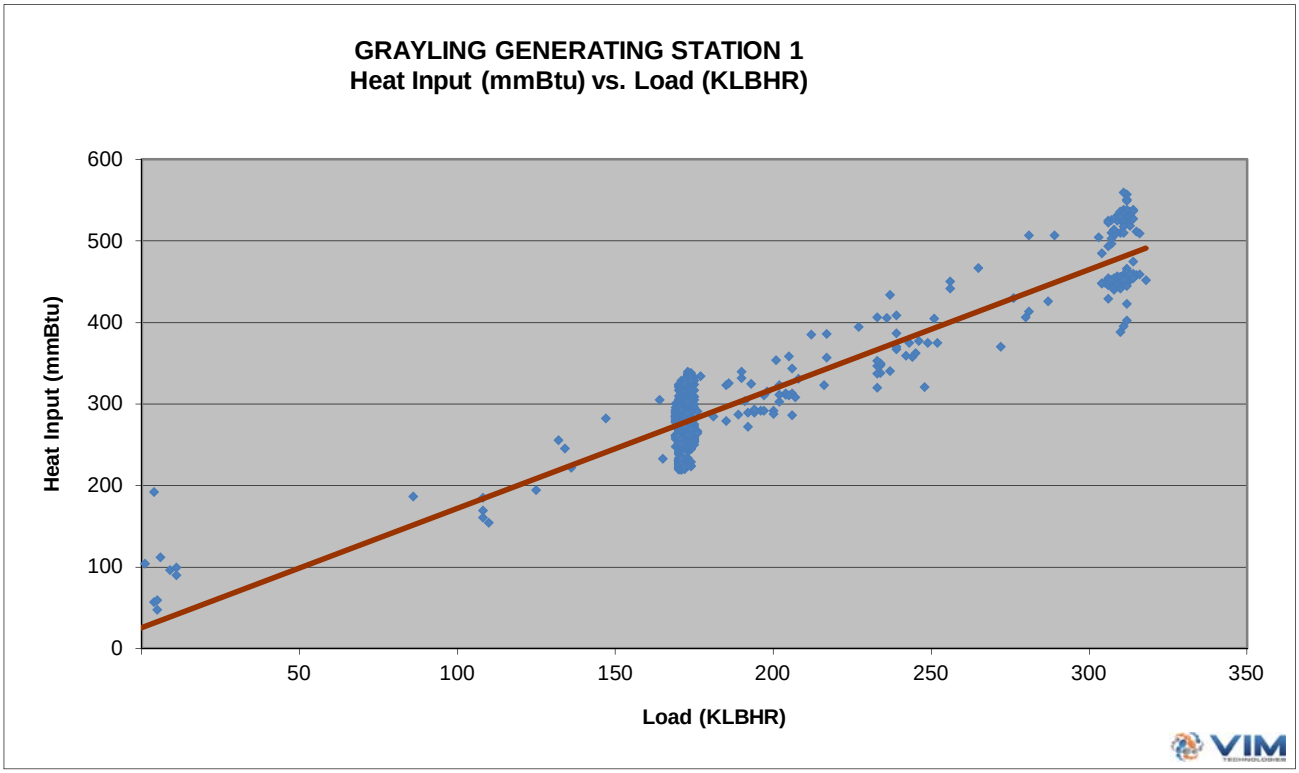
= Completed this quarter
= Due this quarter (or soon)
= Overdue/Grace Period

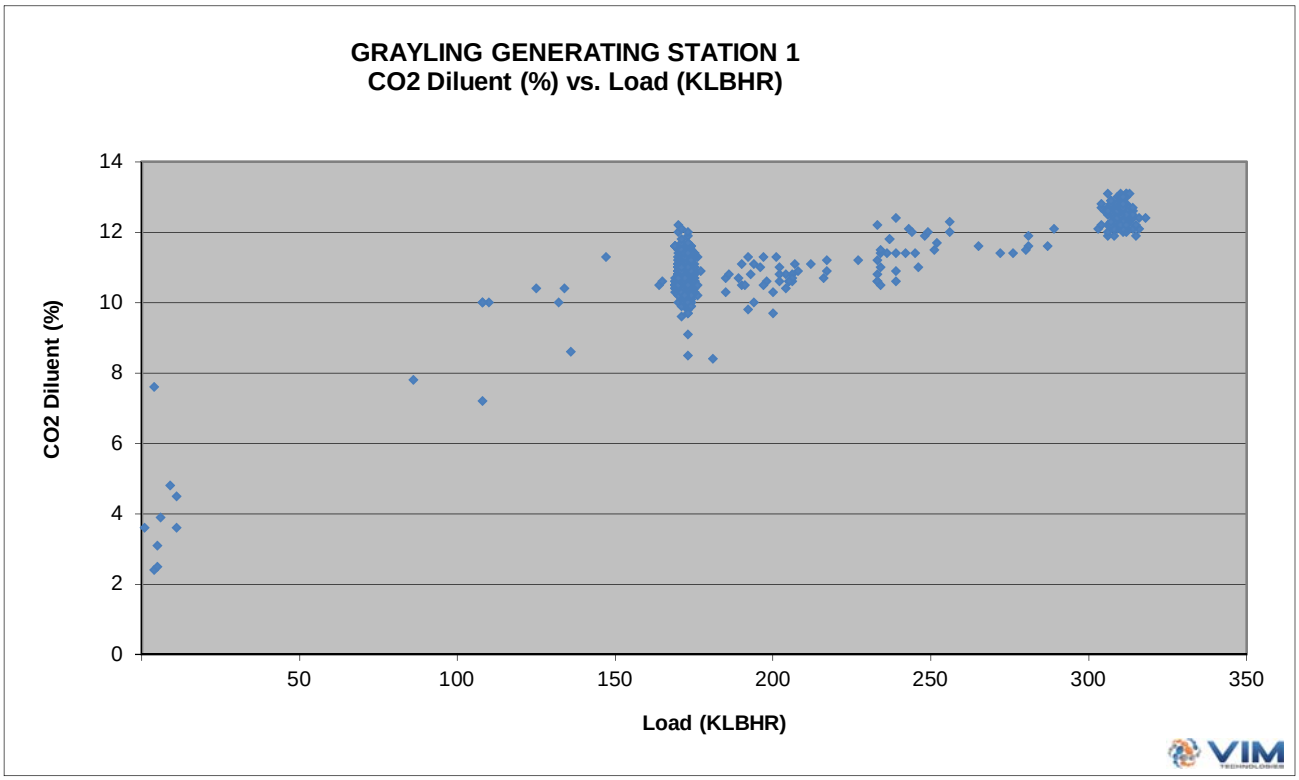
=QA Operating Quarter
= Operating Quarter
= No Operating Data

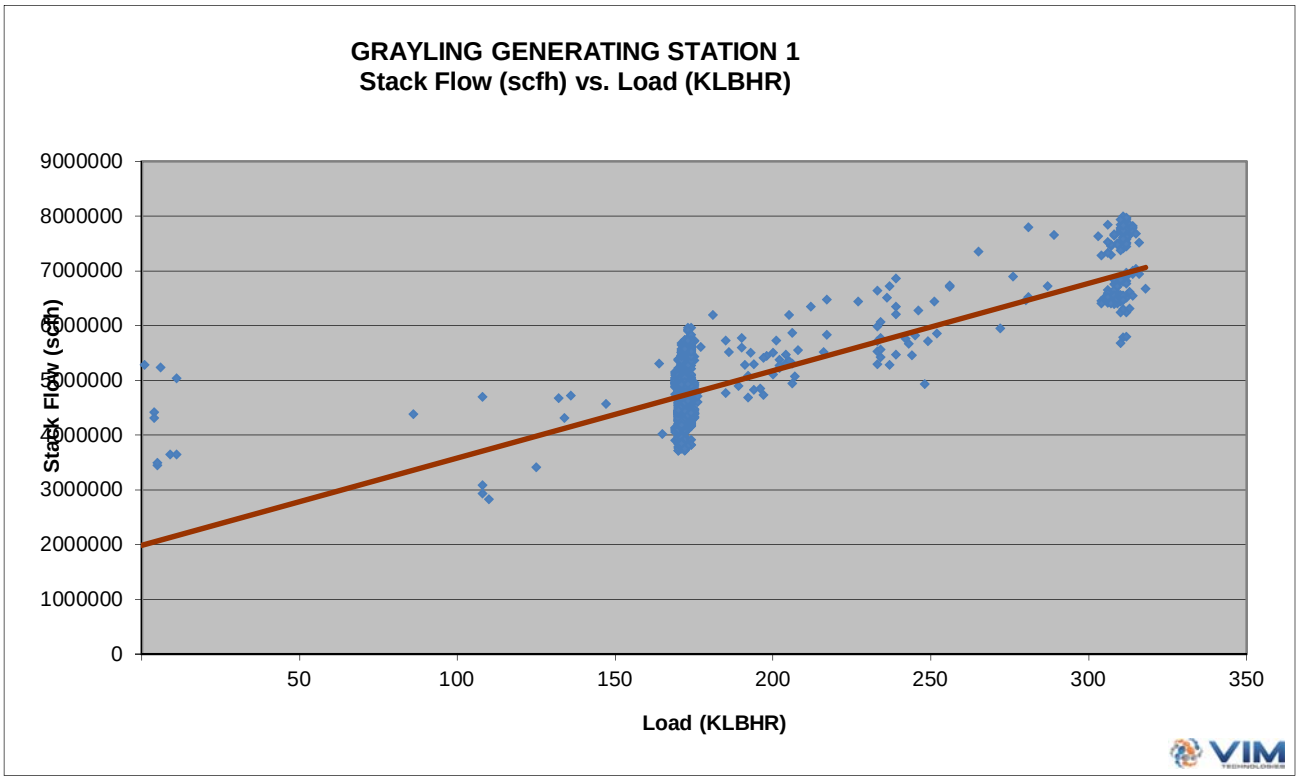
Company: **GRAYLING**	ORIS Code: **10822**
Location: **GENERATING STATION**	Year: **2017**
Unit: **1**	Quarter: **4**

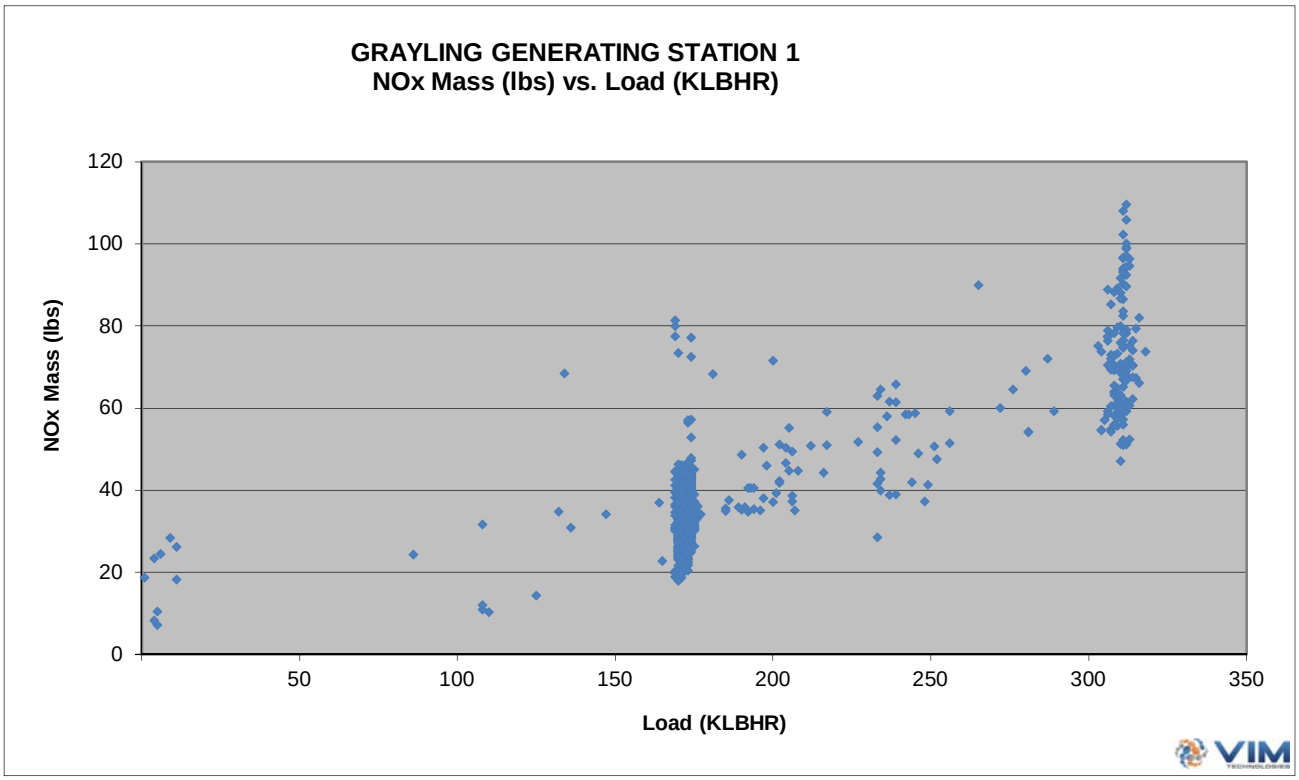
EDR Summary Data			
	Quarter	**Ozone Season**	**Year To Date**
QA Op Hours:	1,925	3,458	8,046
Op Time:	1,921.36	3,452.41	8,032.94
Heat Input:	562,213	1,195,076	2,661,801
NOx Mass:	35.7	79.5	171.3
NOx Rate:	N/A		N/A
SO2 Mass:	1.6		7.5
CO2 Mass:	N/A		N/A

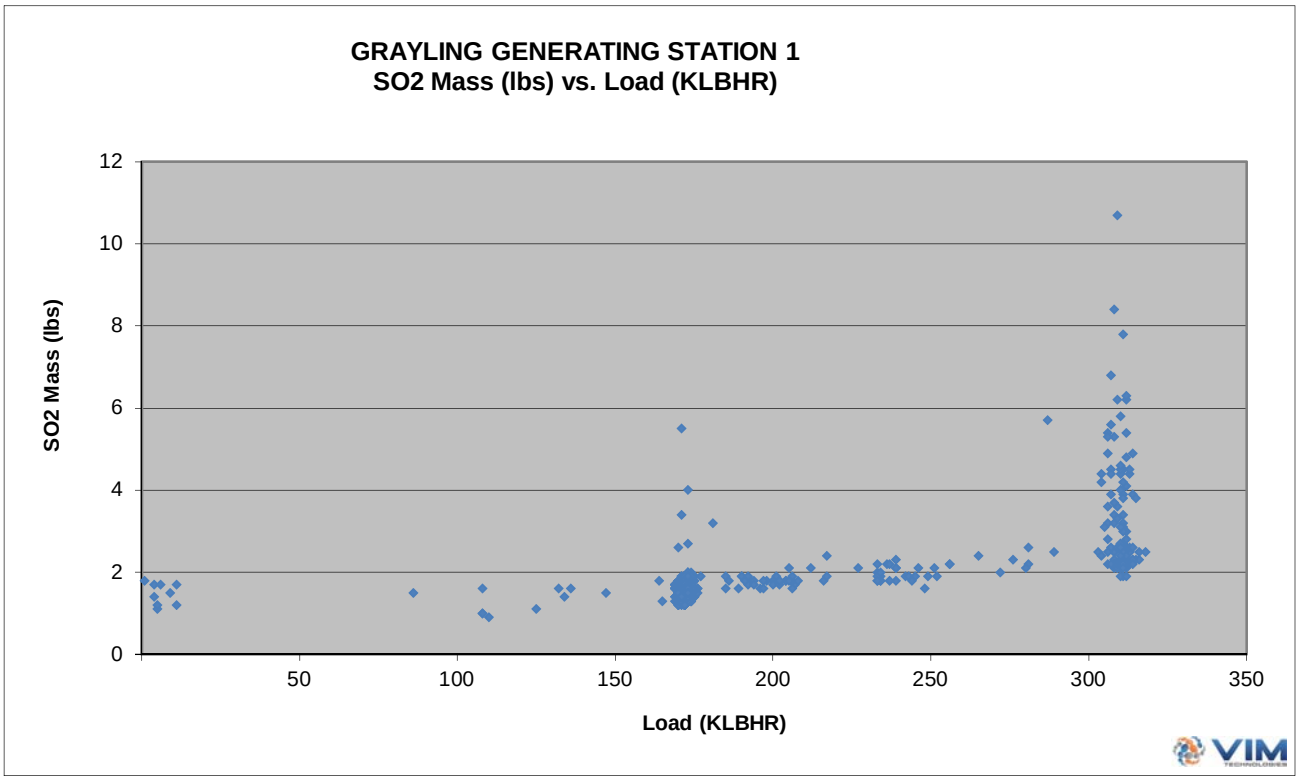
Statistical Correlations			
Diluent / Load:	80.5%	**Stack Flow / Load:**	80.8%
Heat Input / Load:	89.1%	**NOx Mass / Load:**	82.0%
NOx Rate / Load:	29.8%		
SO2 Mass / Load:	69.7%		
Unit Heat Input Rate:	1.603	**mmBtu/KLBHR**	

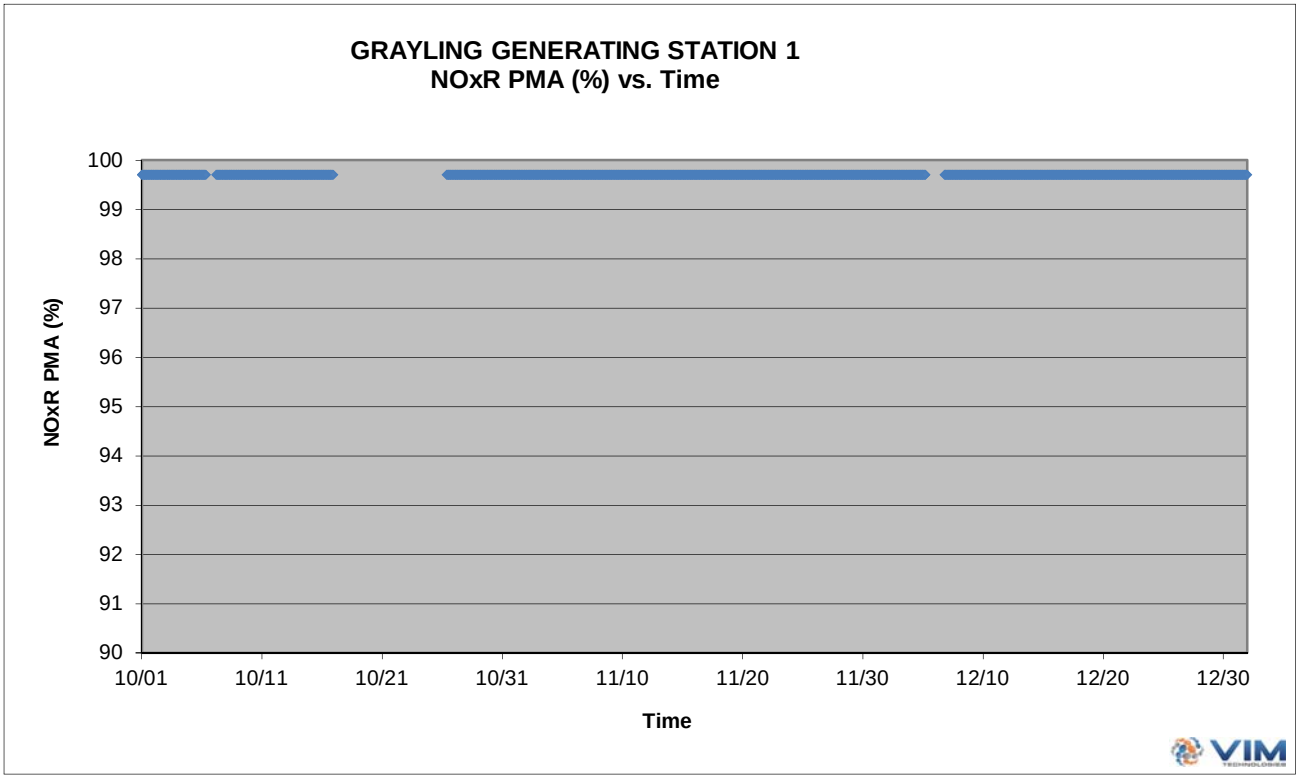


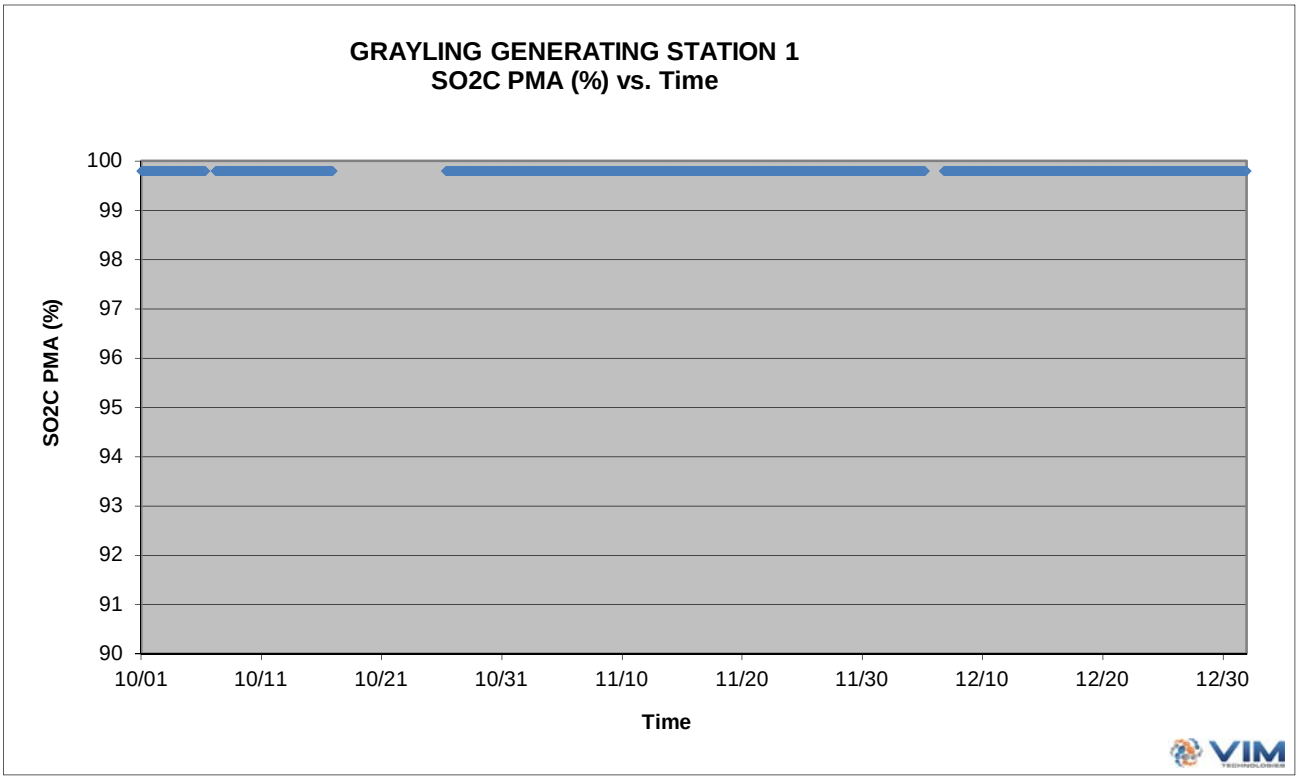


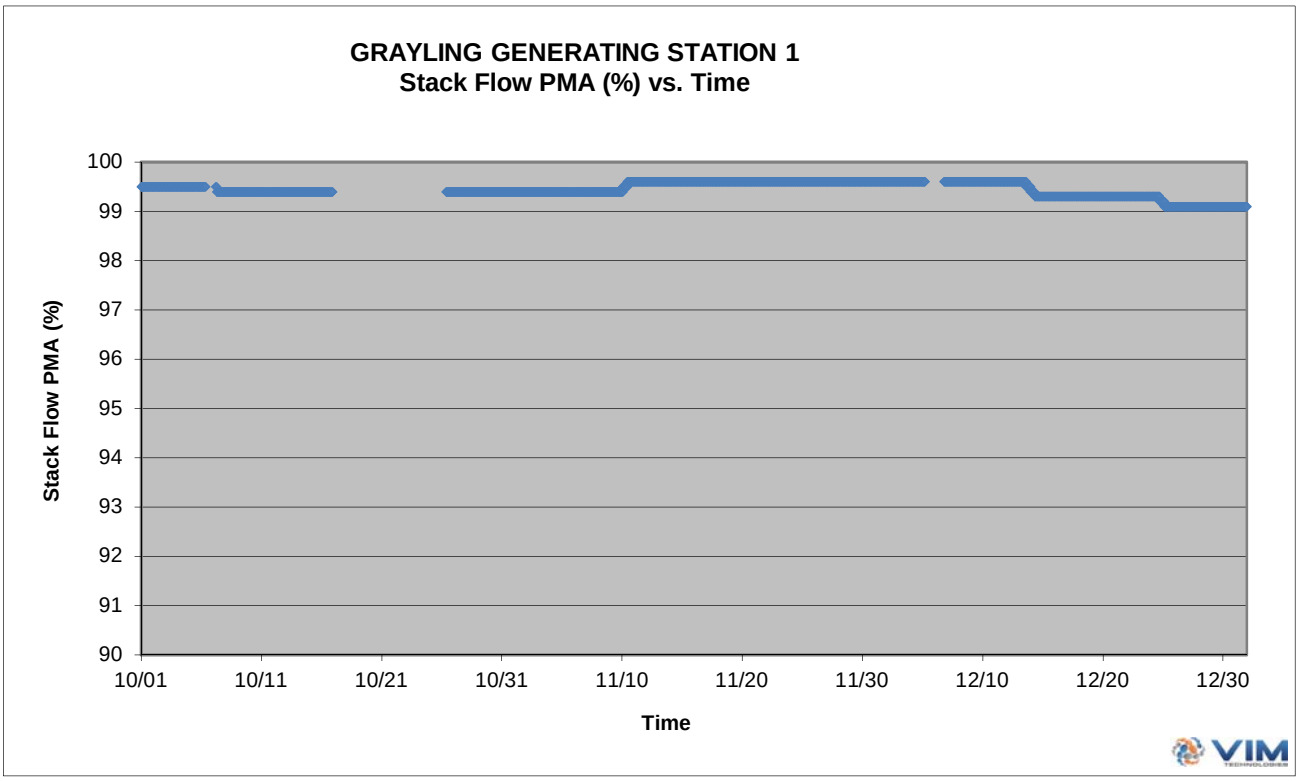


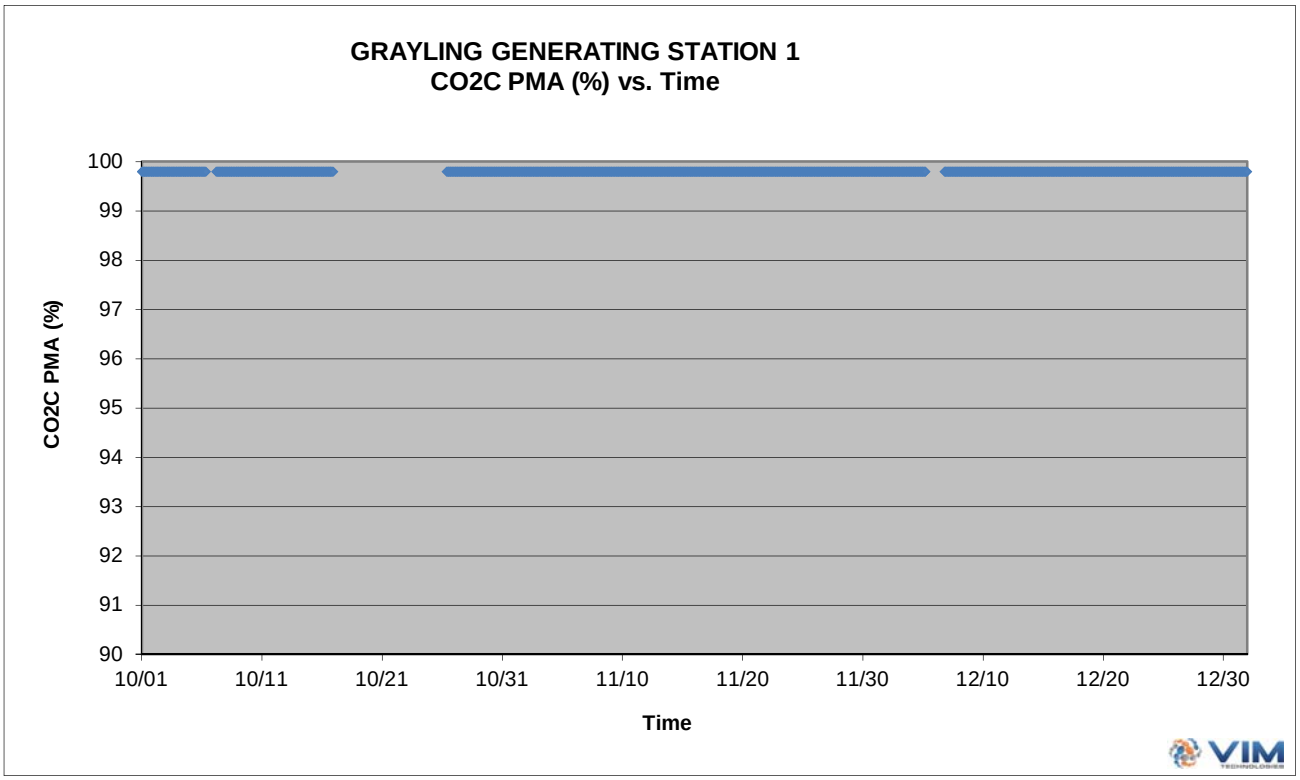


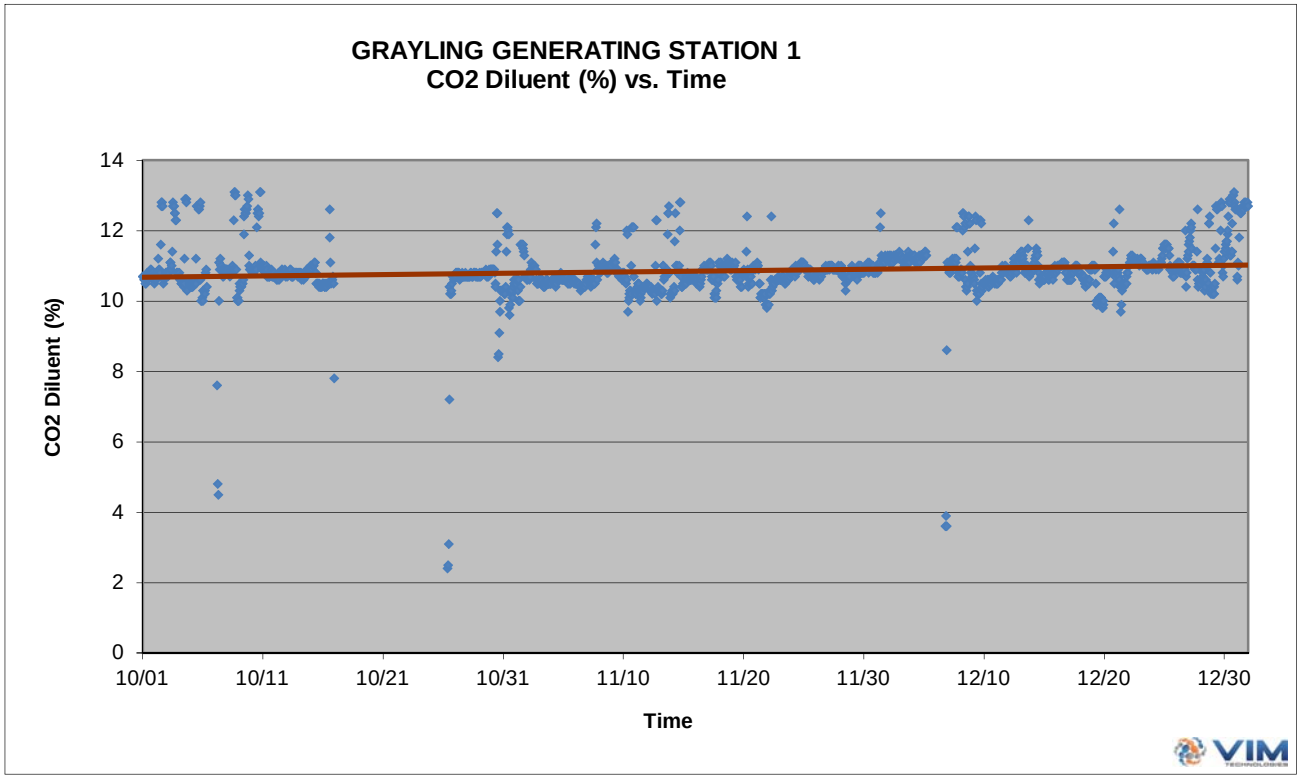




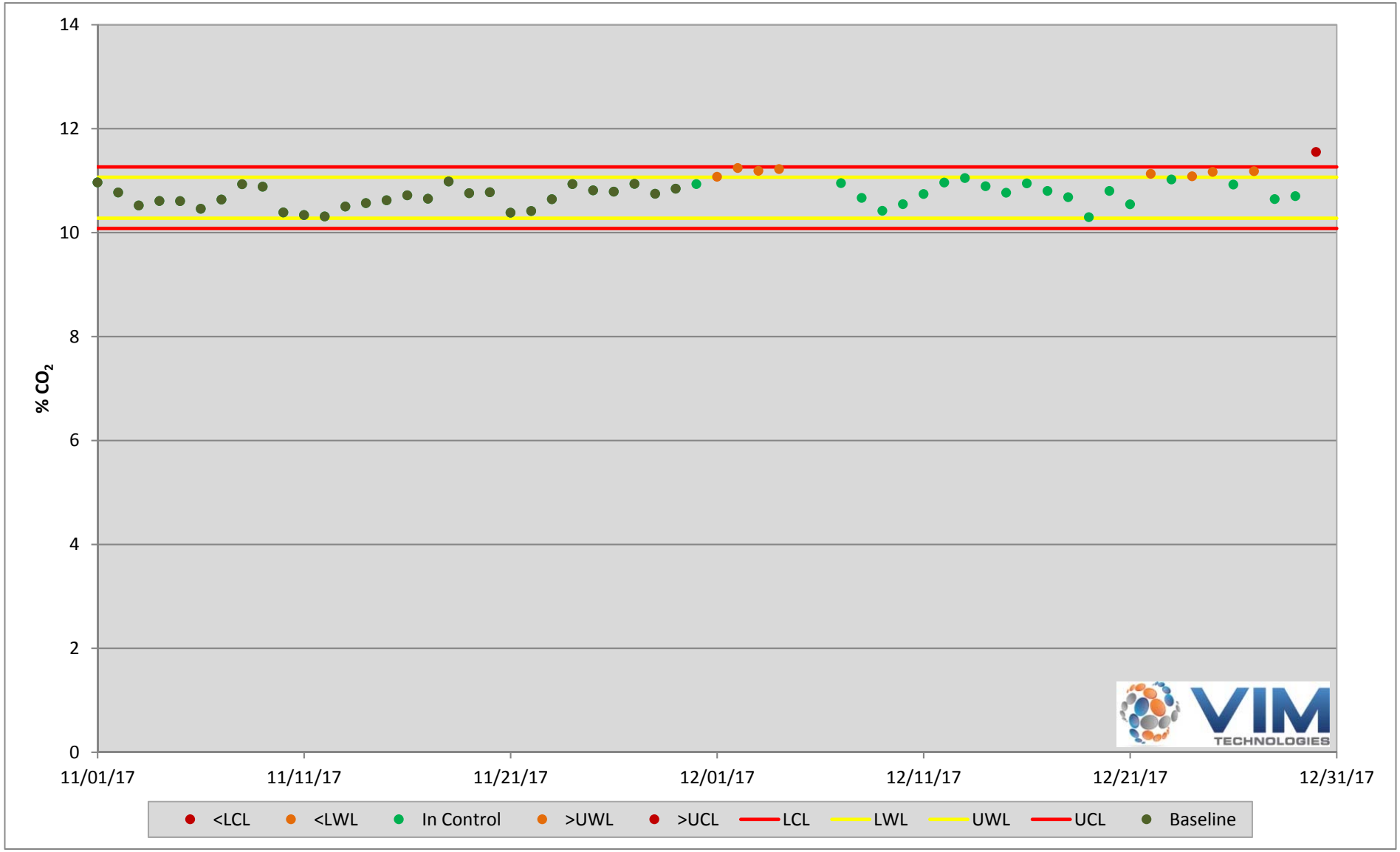







GRAYLING GENERATING STATION 1
CO2 Diluent (%) vs. Time
CO2 Diluent (%)
14
12
10
8
6
4
2
0
10/01
10/11
10/21
10/31
11/10
11/20
11/30
12/10
12/20
12/30
Time
VIM

CO2 Control Chart: GRAYLING GENERATING STATION 1



RATA Date
10/31/2017

Load Bin
5

Consecutive Days	LCL	LWL	--	UWL	UCL
Outside Limits	0	0		4	1

ECMPS Client Tool

Version 1.0 2017 Q4

Monitoring Plan Evaluation Report

January 17, 2018 11:27 AM

Facility Name: Grayling Generating Station

Facility Details

Facility ID (ORISPL):	10822
Monitoring Plan Location IDs:	1
State:	MI
County:	Crawford County

Evaluation Results

There are no errors

ECMPS Client Tool

Version 1.0 2017 Q4

QA/Cert Events Evaluation Report

January 17, 2018 11:42 AM

Facility Name: Grayling Generating Station

Facility Details

Facility ID (ORISPL):	10822
State:	MI
County:	Crawford County

Evaluation Results

Unit/Stack Identifier	Event Code	Event Date/Hour	System ID / Type	Component ID / Type	Result
1	300	10/24/2017 15	FL1/FLOW	106/FLOW	There are no errors

QA/Cert Test Evaluation Report

January 17, 2018 11:27 AM

Facility Name: Grayling Generating Station

Facility Details

Facility ID (ORISPL):	10822
Monitoring Plan Location IDs:	1
State:	MI
County:	Crawford County

Evaluation Results

Unit/Stack Identifier	Test Type	Test Number Test Date/Hour	Sys / Comp ID / Type	Severity	Check Code	Result
1	7DAY	106-2017Q4 11/01/2017 10:04	106/FLOW			There are no errors
	F2LCHK	FL1-FTL-2017Q4-L 2017 Q4	FL1/FLOW			There are no errors
		FL1-FTL-2017Q4-M 2017 Q4	FL1/FLOW			There are no errors
	F2LREF	FL1-FTL-2017Q4-L 11/01/2017 10:14	FL1/FLOW			There are no errors
		FL1-FTL-2017Q4-M 10/30/2017 17:40	FL1/FLOW			There are no errors
	LINE	101-2017Q4 12/28/2017 14:00	101/NOX			There are no errors
		102-2017Q4 12/28/2017 14:00	102/SO2			There are no errors
		103-2017Q4 12/28/2017 14:00	103/CO2			There are no errors
	RATA	CO1-2017Q4-1 10/31/2017 20:02	CO1/CO2			There are no errors
		FL1-2017Q4-2 11/01/2017 10:14	FL1/FLOW	NONCRIT	RATA-42-B	The separation of the low and mid operating levels for this test does not represent at least 25% of the operating range of the unit or stack.
		NO1-2017Q4-3 10/31/2017 20:02	NO1/NOX			There are no errors
		SO1-2017Q4-4 10/31/2017 20:02	SO1/SO2			There are no errors

ECMPS Client Tool

Version 1.0 2017 Q4

Emissions Evaluation Report

January 17, 2018 02:46 PM

Facility Name: Grayling Generating Station

Facility Details

Facility ID (ORISPL):	10822
Monitoring Plan Location IDs:	1
State:	MI
County:	Crawford County
Year/Quarter:	2017 Q4
Total Hours:	2208

Evaluation Results

There are no errors

VIM TECHNOLOGIES
6960 Aviation Blvd., Suite G, Glen Burnie, MD 21061 • (410) 859-5455 • FAX (410) 859-5457

Technical Memo

To: Richard Laur, Ed Going

CC: Kathryn Cunningham

From: Dru Sanders

Date: January 12, 2021

Re: Grayling Generating Station – 2020-Q4 COMPAS Evaluation

Summary of Status and Recommendations

- All required recertification tests have been successfully completed on the first attempt.

1. QA Operating Hour Summary:

- Unit 1 has operated for 833 hours.

2. QA Test Status (see attached QA Status Report for details)

- Linearity checks are complete for this quarter.
- The Flow-To-Load Check High Load Level error (Ef) is 4.1%.
- The Flow-To-Load Check Low Load Level error (Ef) is 5.5%.
- RATAs are complete for this quarter.
- A 3-load Flow RATA was performed in 2017-Q4. The next 3-load RATA will be due 2022-Q4.

3. Protocol Gas Verification Program (PGVP) data:

- No discrepancies with PGVP data were detected.

4. CO_2 Control Chart:

EPA uses this control chart methodology to identify possible leaks in CEMS that can result in under-reporting of emissions. Whenever there are seven (7) or more consecutive daily averages below the lower control limit (LCL), EPA considers this data to be suspect.

- The CO_2 data indicates that the sampling system is properly functioning.

5. Backup Status:

- The last backup was successfully completed.

6. Monitoring Plan updates:

- The monitoring plan has been updated to reflect the CO_2, NO_x, and SO_2 analyzer replacements.

7. Summary of Significant Edits:

VIM invalidated the CO2 and NOx data noted below in ECMPS.

Unit	Start Date	-Hr	End Date	-Hr	Parameter(s)	Reason

QA Status Errors

Unit/Stack/ Pipe	Category Description	Severity	Check Result	Result Message	Begin Date / Hour	End Date / Hour	Consecutive Hours
1	CO2 Linearity Status Evaluation	CRIT1	OOC-Conditional Period Expired	The conditional data period for QACertEventCode 100 QACertEventDate 04/15/2020 for Component ID 107, Span Scale H has expired.	11/03/2020 12	11/03/2020 15	4
	NOX Linearity Status Evaluation	CRIT1	OOC-Conditional Period Expired	The conditional data period for QACertEventCode 100 QACertEventDate 04/14/2020 for Component ID 108, Span Scale H has expired.	11/03/2020 12	11/03/2020 15	4

If you have any questions regarding this report, please feel free to contact me at (410) 859-5455 x4051 or dru.sanders@vimtechnologies.com.

Company: **GRAYLING** Location: **GENERATING STATION** ORIS Code: **10822** Report Date: **01/12/21**

Unit: **1**

Operational History											
Year-Qtr	Op Hours	Year-Qtr	Op Hours	Year-Qtr	Op Hours	Year-Qtr	Op Hours	Year-Qtr	Op Hours	Year-Qtr	Op Hours
		2016-Q1	2184	2017-Q1	973	2018-Q1	2134	2019-Q1	2159	2020-Q1	1732
		2016-Q2	1678	2017-Q2	1919	2018-Q2	2080	2019-Q2	2006	2020-Q2	155
		2016-Q3	2208	2017-Q3	2074	2018-Q3	2207	2019-Q3	2208	2020-Q3	64
		2016-Q4	2136	2017-Q4	1925	2018-Q4	1935	2019-Q4	2115	2020-Q4	833

System/Component ID:	SO1	FL1	FL1	109	108	107				
QA Test:	**RATA**	**F2LREF**	**F2LCHK**	**LINE**	**LINE**	**LINE**				
Date of Last Test:	**11/13/2020**	**11/13/2020**	**12/31/2020**	**11/03/2020**	**11/03/2020**	**11/03/2020**				
Year-Qtr of Last Test:	2020-Q4	2020-Q4	2020-Q4	2020-Q4	2020-Q4	2020-Q4				
Limit in Operating Quarters:	4 (QA)	4 (QA)	1 (QA)	1 (QA)	1 (QA)	1 (QA)				
Due Date Based on Op Quarters:	12/31/2021	12/31/2021	03/31/2021	03/31/2021	03/31/2021	03/31/2021				
Limit in Calendar Quarters	8	8	NA	4	4	4				
Due Date Based on Cal Quarters:	12/31/2022	12/31/2022	NA	12/31/2021	12/31/2021	12/31/2021				
Allowable Grace Perod:	720 (hrs)	720 (hrs)	NONE	168 (hrs)	168 (hrs)	168 (hrs)				
Grace period Used:	0	0	NA	0	0	0				

RATA = Relative Accuracy Test Audit
LINE = Linearity Test Audit
FFACCTT = Fuel Flow Transmitter Accuracy Test
PEI = Primary Element Inspection

LEAK = Leak Check
F2LREF = Flow-To-Load Reference Test
F2LBAS = Flow-To-Load Baseline Test
(G) = Grace Period indicator

= Completed this quarter
= Due this quarter (or soon)
= Overdue/Grace Period

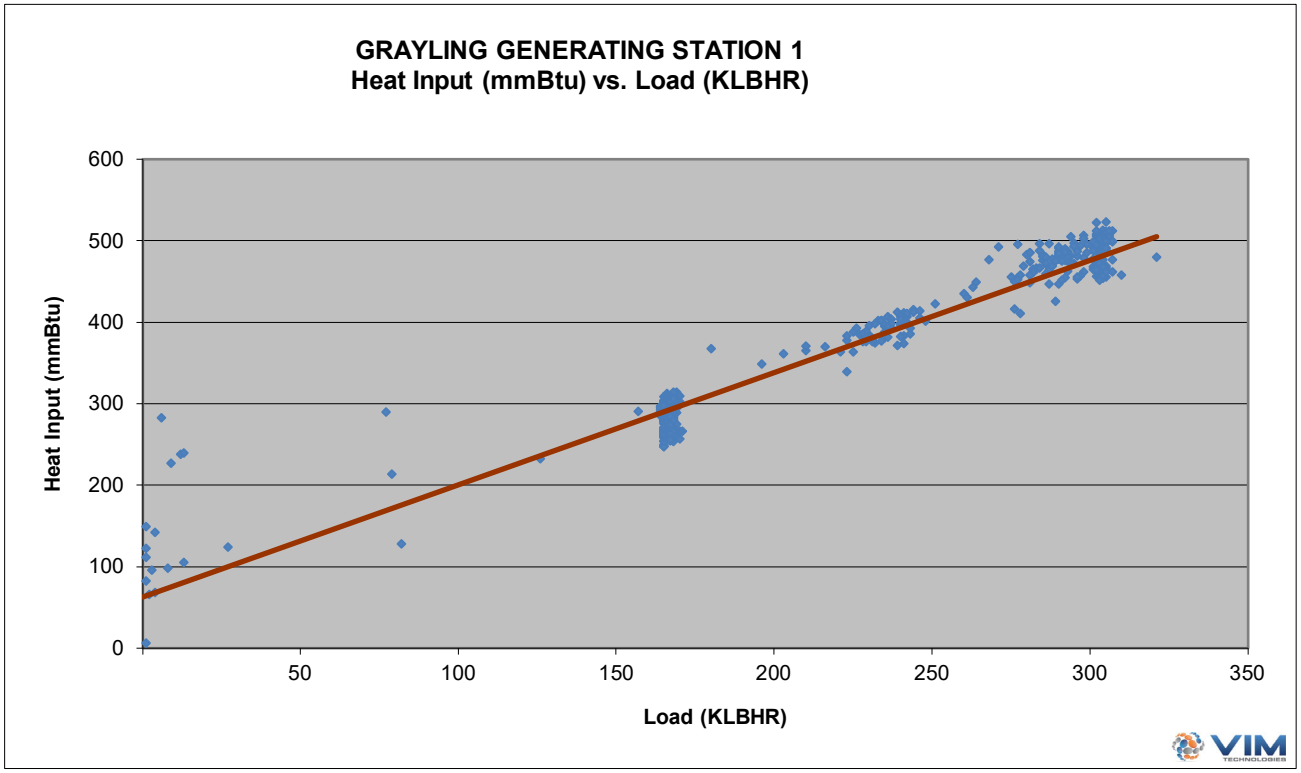
=QA Operating Quarter
= Operating Quarter
= No Operating Data

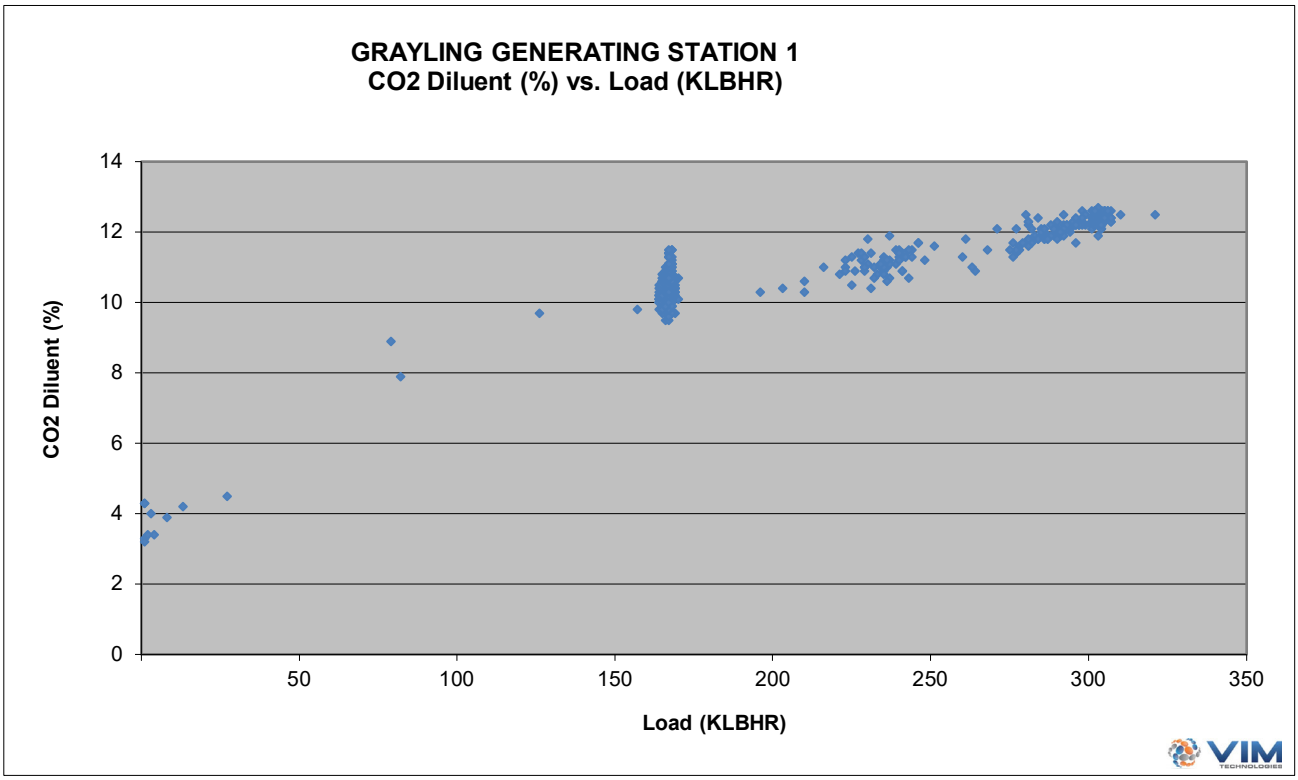
VIM TECHNOLOGIES

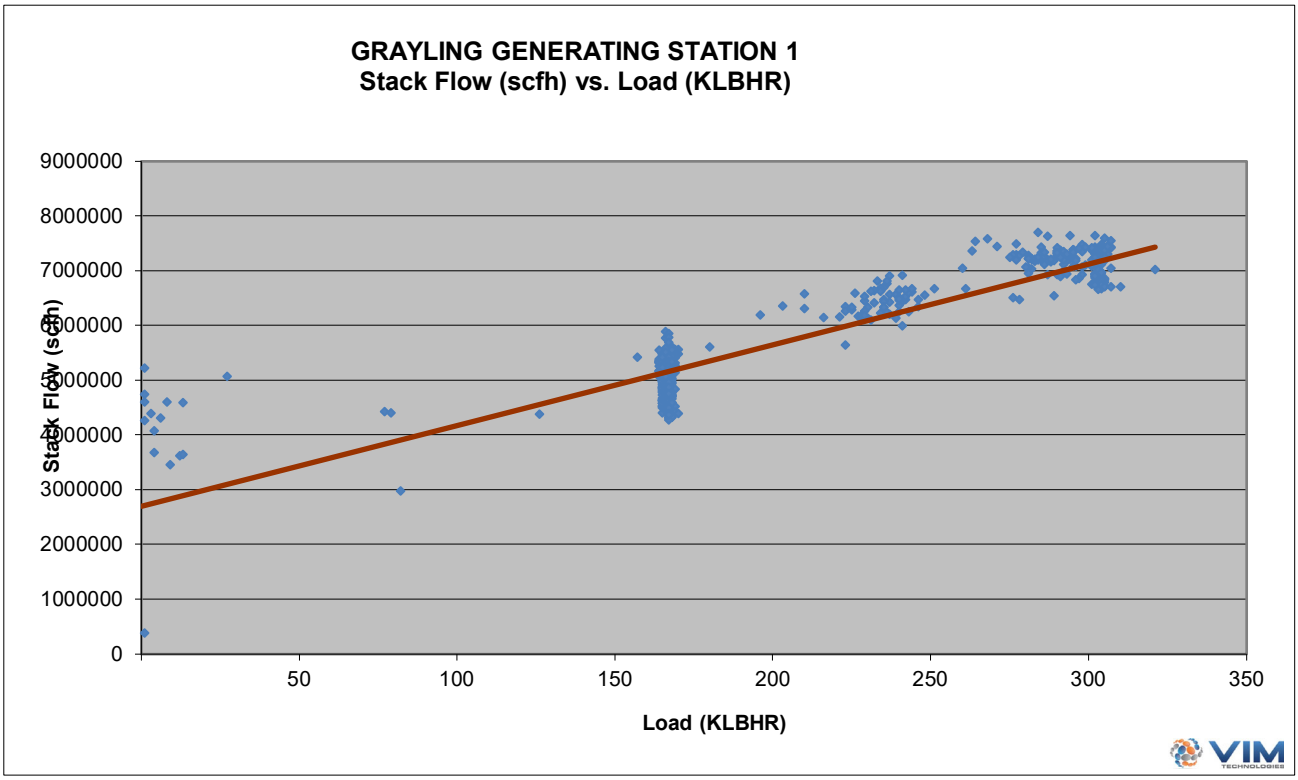
Company: **GRAYLING**	ORIS Code: **10822**
Location: **GENERATING STATION**	Year: **2020**
Unit: **1**	Quarter: **4**

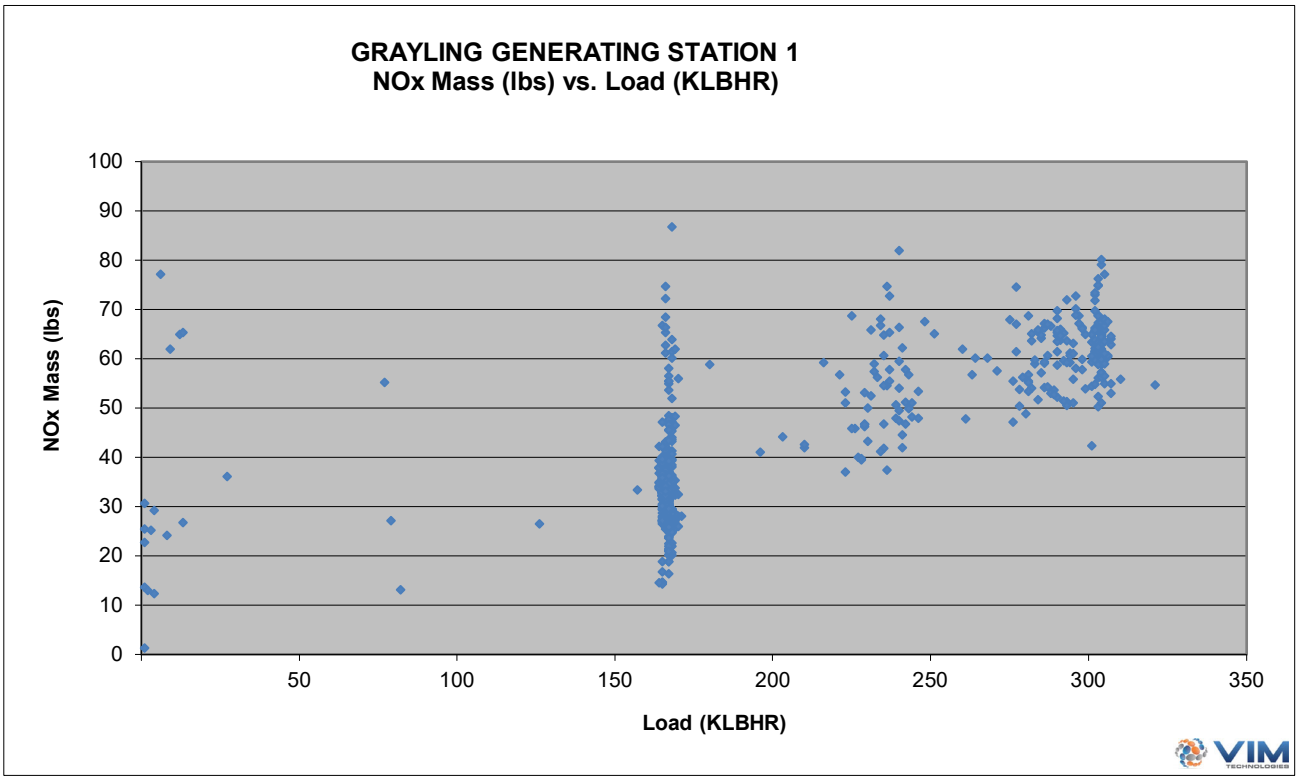
EDR Summary Data			
	Quarter	**Ozone Season**	**Year To Date**
QA Op Hours:	833	219	2,784
Op Time:	826.18	213.18	2,769.06
Heat Input:	275,138	71,018	851,966
NOx Mass:	17.0	5.2	48.9
NOx Rate:	N/A		N/A
SO2 Mass:	1.2		3.2
CO2 Mass:	N/A		N/A

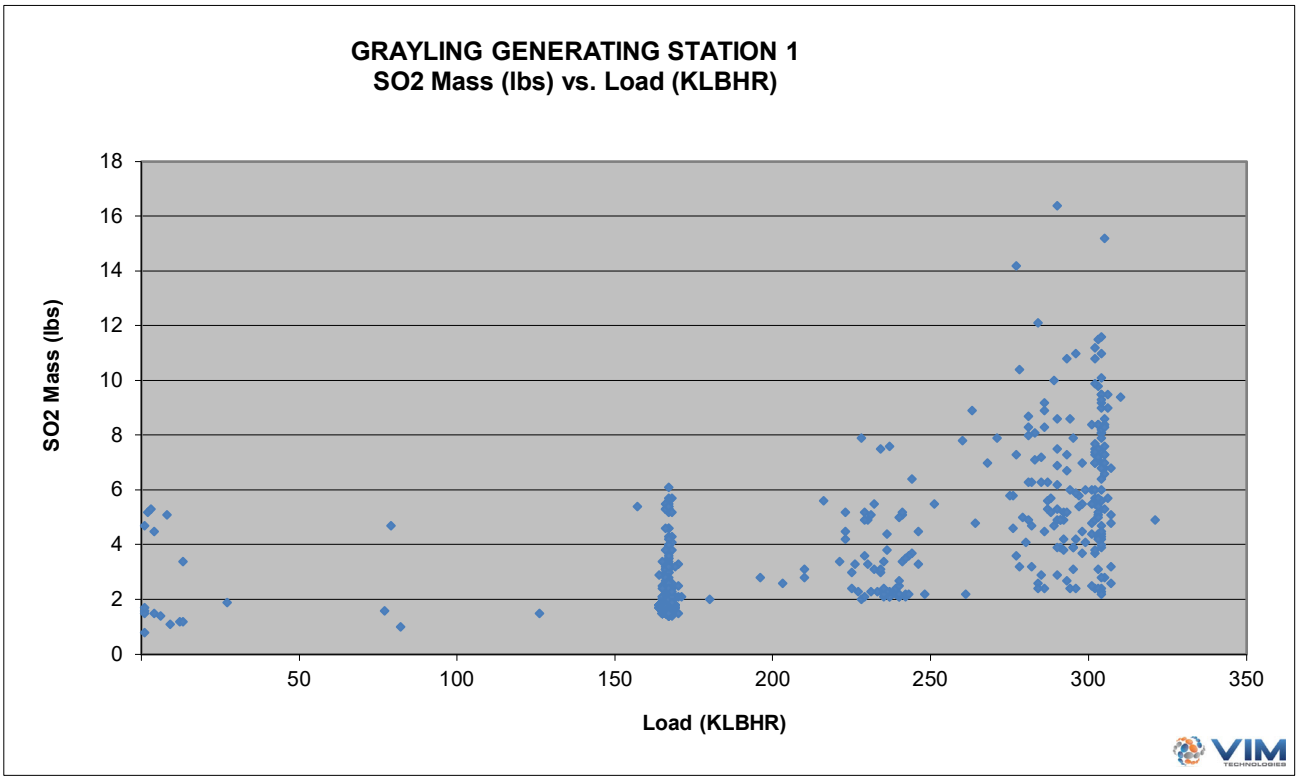
Statistical Correlations			
Diluent / Load:	93.0%	**Stack Flow / Load:**	94.0%
Heat Input / Load:	98.1%	**NOx Mass / Load:**	83.7%
NOx Rate / Load:	22.8%		
SO2 Mass / Load:	77.0%		
Unit Heat Input Rate:	1.701	**mmBtu/KLBHR**	

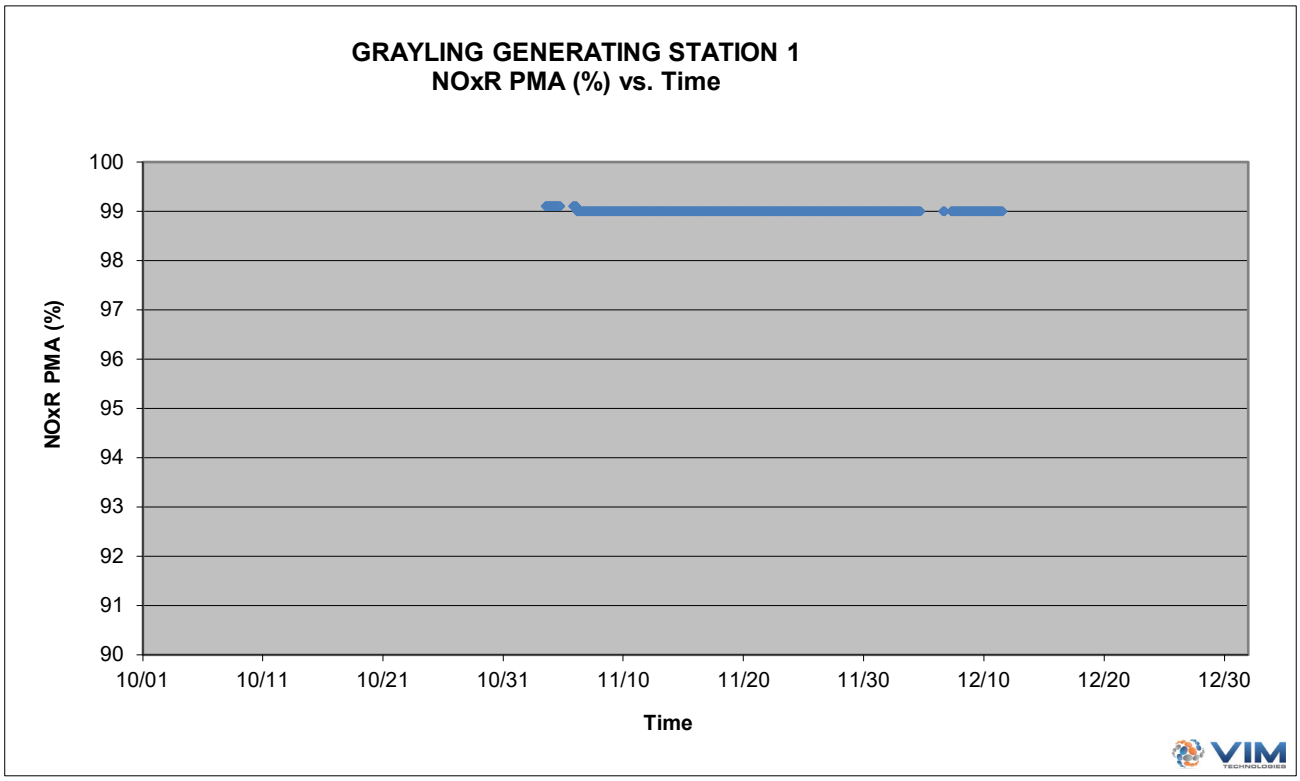


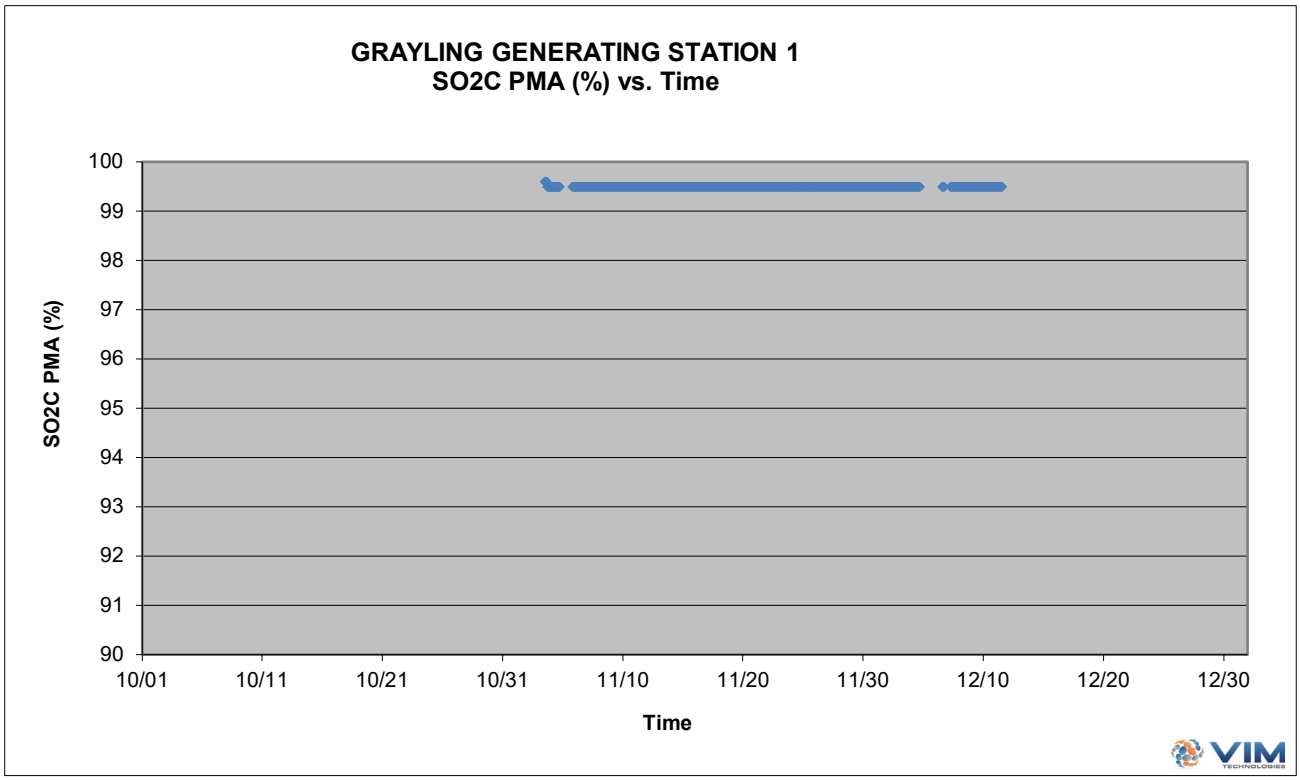


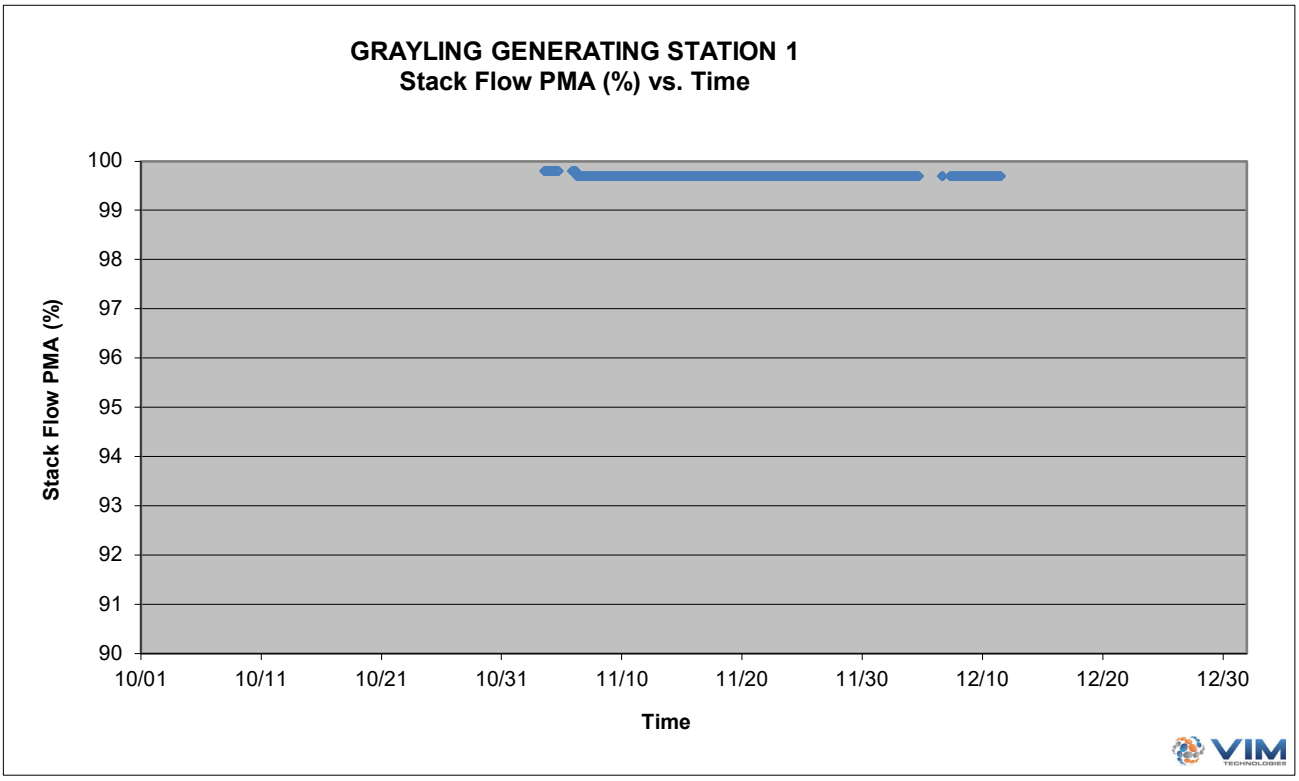


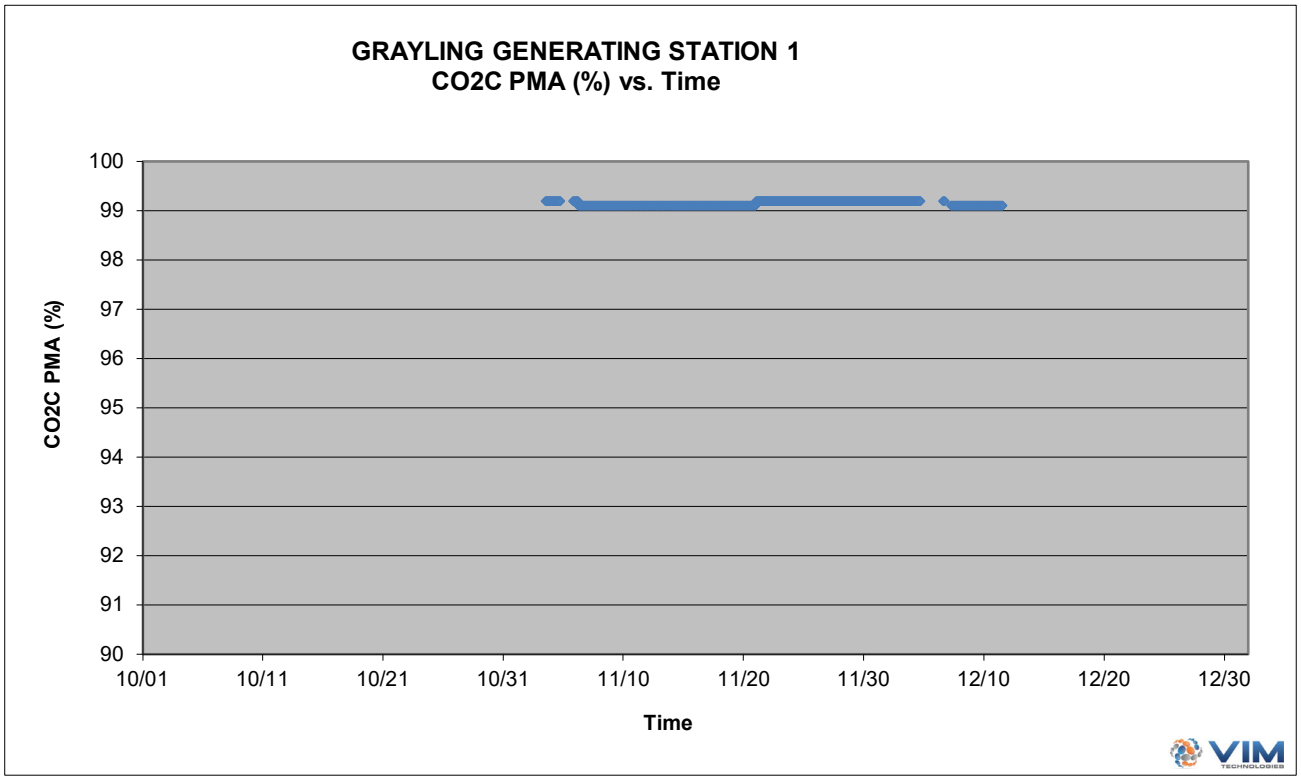


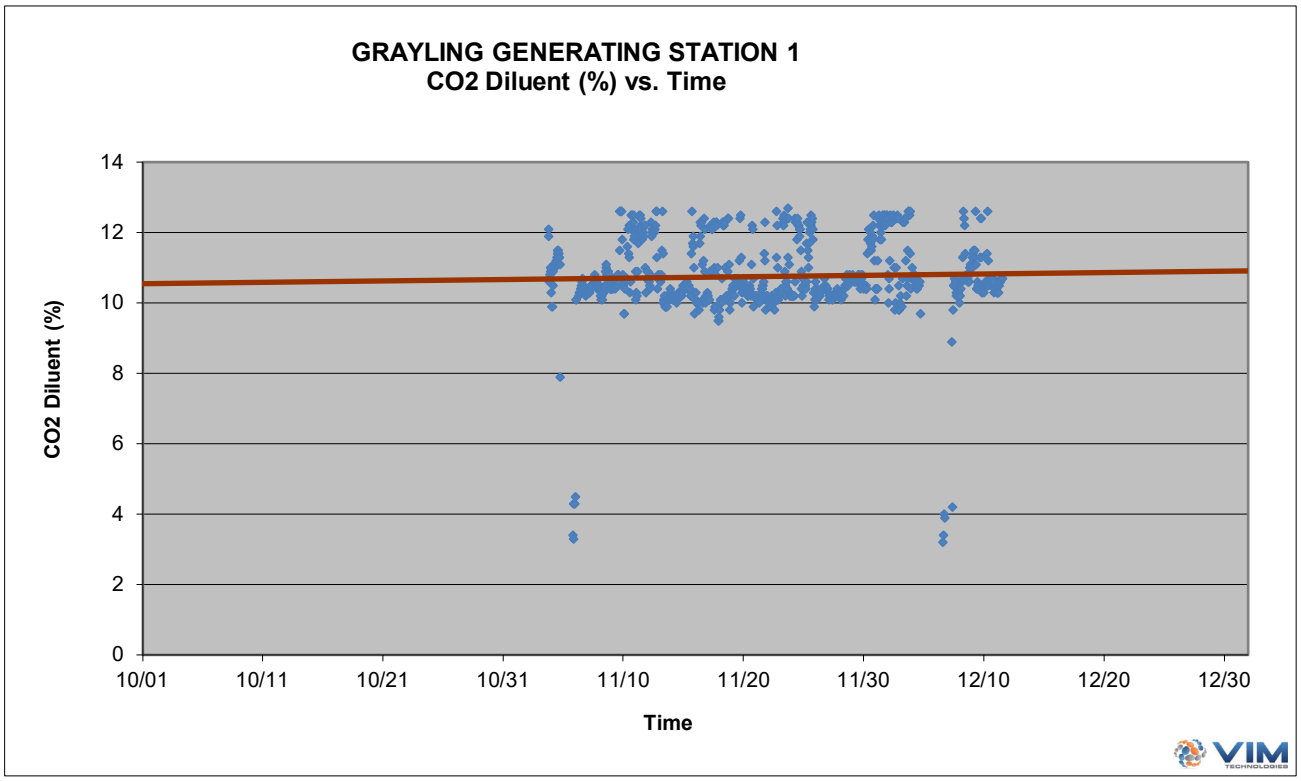




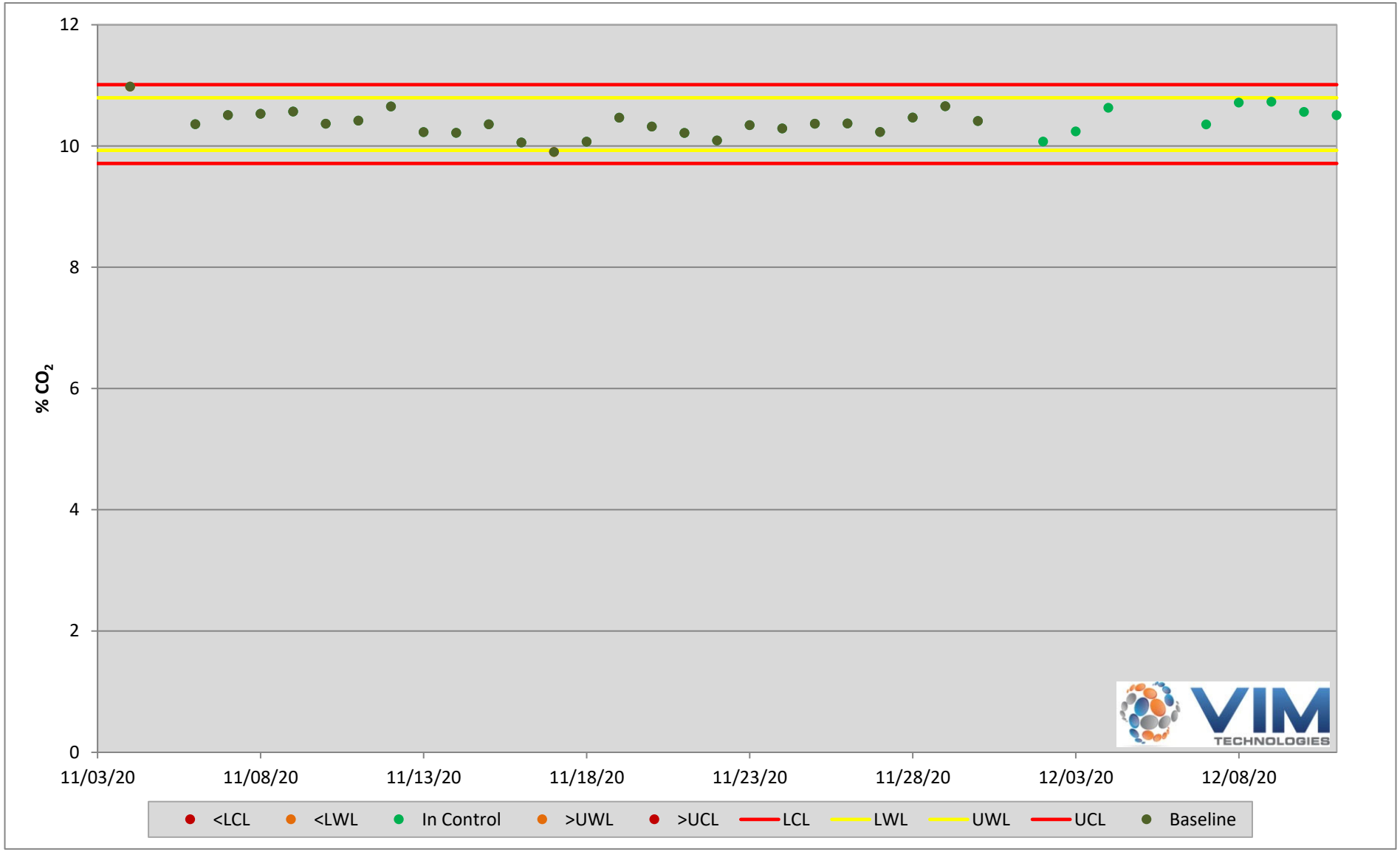







GRAYLING GENERATING STATION 1
CO2 Diluent (%) vs. Time
CO2 Diluent (%)
14
12
10
8
6
4
2
0
10/01
10/11
10/21
10/31
11/10
11/20
11/30
12/10
12/20
12/30
Time
VIM

CO2 Control Chart: GRAYLING GENERATING STATION 1



RATA Date
10/13/2020

Load Bin
5

Consecutive Days	LCL	LWL	--	UWL	UCL
Outside Limits	0	1		1	0

ECMPS Client Tool

Version 1.* 2020 Q4

QA/Cert Test Evaluation Report

January 12, 2021 03:07 PM

Facility Name: Grayling Generating Station

Facility Details

Facility ID (ORISPL):	10822
Monitoring Plan Location IDs:	1
State:	MI
County:	Crawford County

Evaluation Results

Unit/Stack Identifier	Test Type	Test Number Test Date/Hour	Sys / Comp ID / Type	Result
1	7DAY	107-7DAY-11/13/202 11/13/2020 08:14	107/CO2	There are no errors
		108-7DAY-11112020 11/11/2020 08:14	108/NOX	There are no errors
		109-7DAY-11132020 11/13/2020 08:14	109/SO2	There are no errors
	CYCLE	CO1-CYCLE-2020Q3 11/03/2020 17:47	107/CO2	There are no errors
		NOX-CYCLE_2020Q3 11/03/2020 17:47	108/NOX	There are no errors
		SO2-CYCLE-2020Q3 11/03/2020 17:48	109/SO2	There are no errors
	F2LCHK	FL1-2020Q4-H 2020 Q4	FL1/FLOW	There are no errors
		FL1-2020Q4-L 2020 Q4	FL1/FLOW	There are no errors
	F2LREF	FL1-FTLRH-2020Q4 11/10/2020 18:00	FL1/FLOW	There are no errors
		FL1-FTLRL-2020Q4 11/13/2020 14:46	FL1/FLOW	There are no errors
	LINE	107-11032020 11/03/2020 17:11	107/CO2	There are no errors
		108-11032020 11/03/2020 17:11	108/NOX	There are no errors
		109-11032020 11/03/2020 17:11	109/SO2	There are no errors
	RATA	CO1-RATA-11132020 11/13/2020 14:55	CO1/CO2	There are no errors

Facility Name: **Grayling Generating Station**

Facility ID (ORISPL): **10822**

QA/Cert Test Evaluation Report

January 12, 2021 03:07 PM

Unit/Stack Identifier	Test Type	Test Number Test Date/Hour	Sys / Comp ID / Type	Result
1	RATA	FL1-RATA-11132020 11/13/2020 14:46	FL1/FLOW	There are no errors
		NO1-RATA-11132020 11/13/2020 14:59	NO1/NOX	There are no errors
		SO1-RATA-11132020 11/13/2020 14:59	SO1/SO2	There are no errors

ECMPS Client Tool

Version 1.* 2020 Q4

Emissions Evaluation Report

January 12, 2021 03:06 PM

Facility Name: Grayling Generating Station

Facility Details

Facility ID (ORISPL):	10822
Monitoring Plan Location IDs:	1
State:	MI
County:	Crawford County
Year/Quarter:	2020 Q4
Total Hours:	2208

Evaluation Results

General Errors

Severity	Check Code / Result	Result Message
INFORM	HOURGEN-13-A	The emissions quarterly report cannot be submitted, either because the EPA has not yet opened the submission window, you have not logged into the EPA host system, or you are no longer a representative or agent for this facility. If you are a representative or agent for this facility, when EPA opens the submission window you should log in to the EPA host system to receive automatic permission to submit. You will then need to reevaluate this file prior to submitting.

VIM TECHNOLOGIES
6960 Aviation Blvd., Suite G, Glen Burnie, MD 21061 • (410) 859-5455 • FAX (410) 859-5457

Technical Memo

To: Richard Laur, Ed Going

CC: Kathryn Cunningham

From: Dru Sanders

Date: April 15, 2021

Re: Grayling Generating Station – 2021-Q1 COMPAS Evaluation

Summary of Status and Recommendations

1. **QA Operating Hour Summary**:
   - Unit 1 has operated for 2,011 hours.

2. **QA Test Status** (see attached QA Status Report for details)
   - Linearity checks are complete for this quarter.
   - The Flow-To-Load Check High Load Level error (Ef) is 4.9%.
   - The Flow-To-Load Check Low Load Level error (Ef) is 6.4%.
   - A 3-load Flow RATA was performed in 2017-Q4. The next 3-load RATA will be due 2022-Q4.

3. **Protocol Gas Verification Program (PGVP) data**:
   - No discrepancies with PGVP data were detected.

4. **CO_2 Control Chart**:
EPA uses this control chart methodology to identify possible leaks in CEMS that can result in under-reporting of emissions. Whenever there are seven (7) or more consecutive daily averages below the lower control limit (LCL), EPA considers this data to be suspect.
   - The CO_2 data indicates that the sampling system is properly functioning.

5. **Backup Status:**
   - The last backup was successfully completed.

6. **Summary of Significant Edits:**

Unit	Start Date	-Hr	End Date	-Hr	Parameter(s)	Reason
1	2/8/2021	8	2/8/2021	8	Flow	Hourly stack flow reported negative value. Invalidated data & recalculated.

If you have any questions regarding this report, please feel free to contact me at (410) 859-5455 x4051 or dru.sanders@vimtechnologies.com.

Company: **GRAYLING** Location: **GENERATING STATION** ORIS Code: **10822** Report Date: **04/15/21**

Unit: **1**

Operational History											
Year-Qtr	Op Hours	Year-Qtr	Op Hours	Year-Qtr	Op Hours	Year-Qtr	Op Hours	Year-Qtr	Op Hours	Year-Qtr	Op Hours
		2017-Q1	973	2018-Q1	2134	2019-Q1	2159	2020-Q1	1732	2021-Q1	2011
2016-Q2	1678	2017-Q2	1919	2018-Q2	2080	2019-Q2	2006	2020-Q2	155		
2016-Q3	2208	2017-Q3	2074	2018-Q3	2207	2019-Q3	2208	2020-Q3	64		
2016-Q4	2136	2017-Q4	1925	2018-Q4	1935	2019-Q4	2115	2020-Q4	833		

System/Component ID:	SO1	FL1	FL1	109	108	107				
QA Test:	**RATA**	**F2LREF**	**F2LCHK**	**LINE**	**LINE**	**LINE**				
Date of Last Test:	11/13/2020	11/13/2020	**03/31/2021**	**03/09/2021**	**03/09/2021**	**03/09/2021**				
Year-Qtr of Last Test:	2020-Q4	2020-Q4	2021-Q1	2021-Q1	2021-Q1	2021-Q1				
Limit in Operating Quarters:	4 (QA)	4 (QA)	1 (QA)	1 (QA)	1 (QA)	1 (QA)				
Due Date Based on Op Quarters:	12/31/2021	12/31/2021	06/30/2021	06/30/2021	06/30/2021	06/30/2021				
Limit in Calendar Quarters	8	8	NA	4	4	4				
Due Date Based on Cal Quarters:	12/31/2022	12/31/2022	NA	03/31/2022	03/31/2022	03/31/2022				
Allowable Grace Perod:	720 (hrs)	720 (hrs)	NONE	168 (hrs)	168 (hrs)	168 (hrs)				
Grace period Used:	0	0	NA	0	0	0				

RATA = Relative Accuracy Test Audit
LINE = Linearity Test Audit
FFACCTT = Fuel Flow Transmitter Accuracy Test
PEI = Primary Element Inspection

LEAK = Leak Check
F2LREF = Flow-To-Load Reference Test
F2LBAS = Flow-To-Load Baseline Test
(G) = Grace Period indicator

= Completed this quarter
= Due this quarter (or soon)
= Overdue/Grace Period

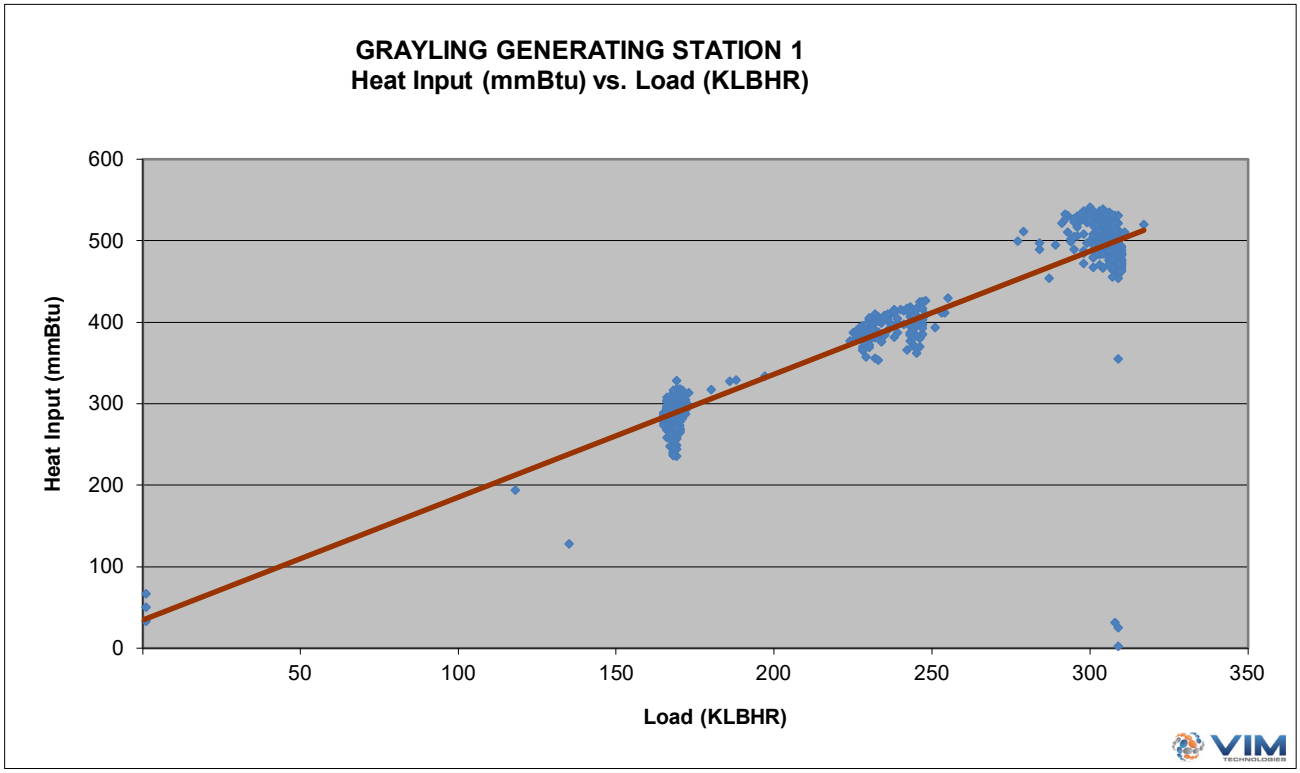
=QA Operating Quarter
= Operating Quarter
= No Operating Data

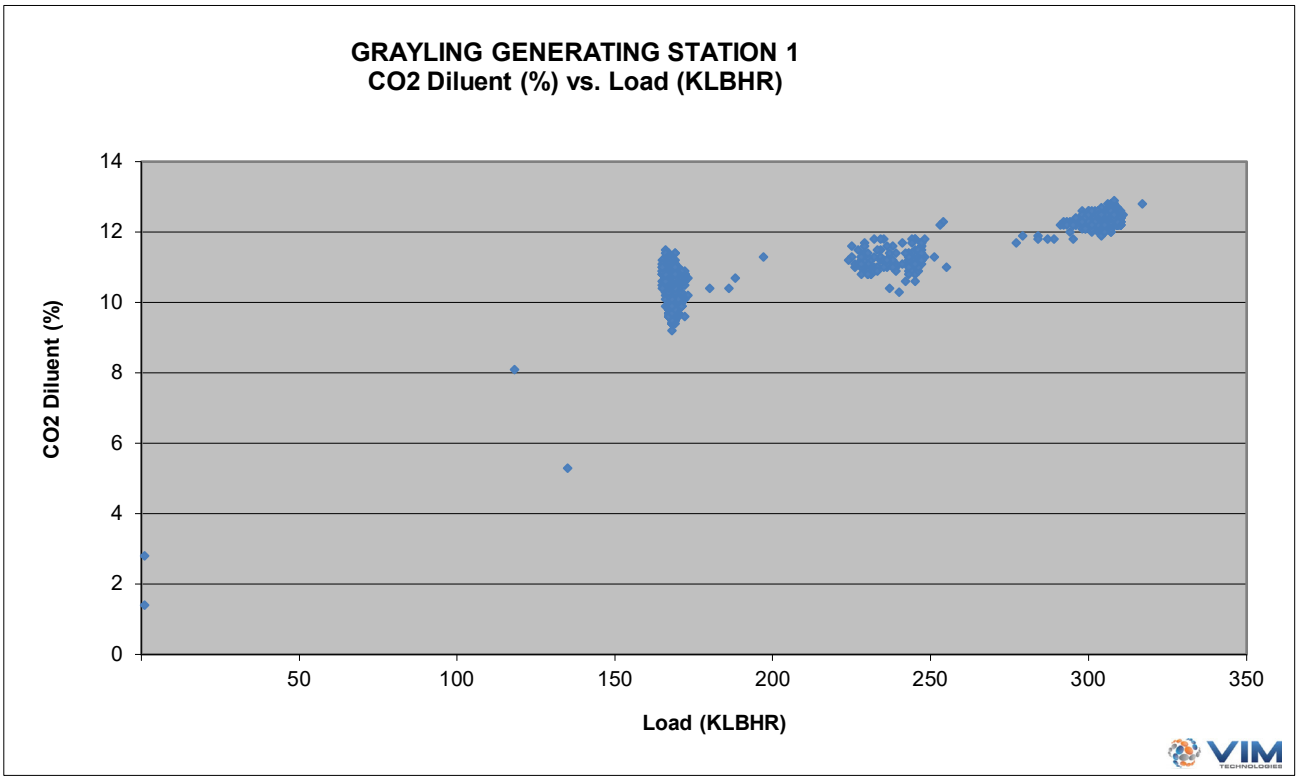
VIM TECHNOLOGIES

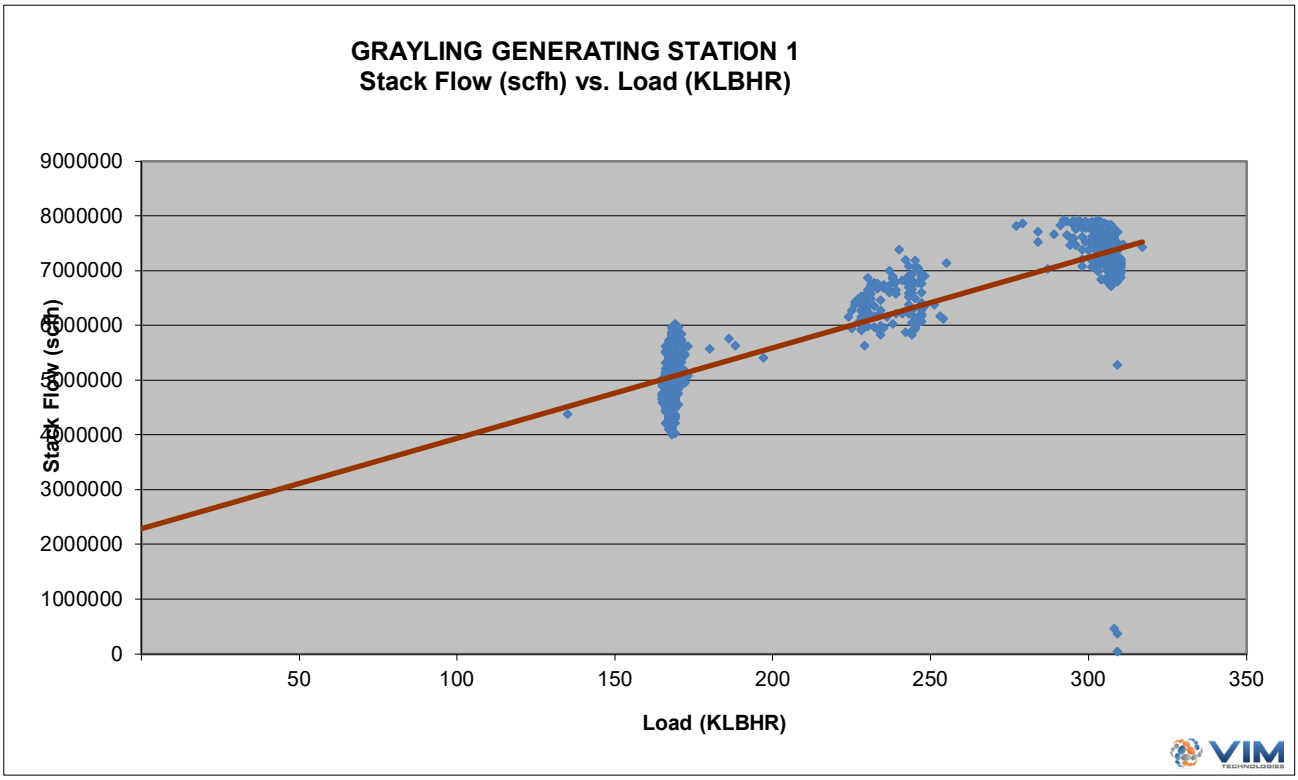
Company: **GRAYLING**	ORIS Code: **10822**
Location: **GENERATING STATION**	Year: **2021**
Unit: **1**	Quarter: **1**

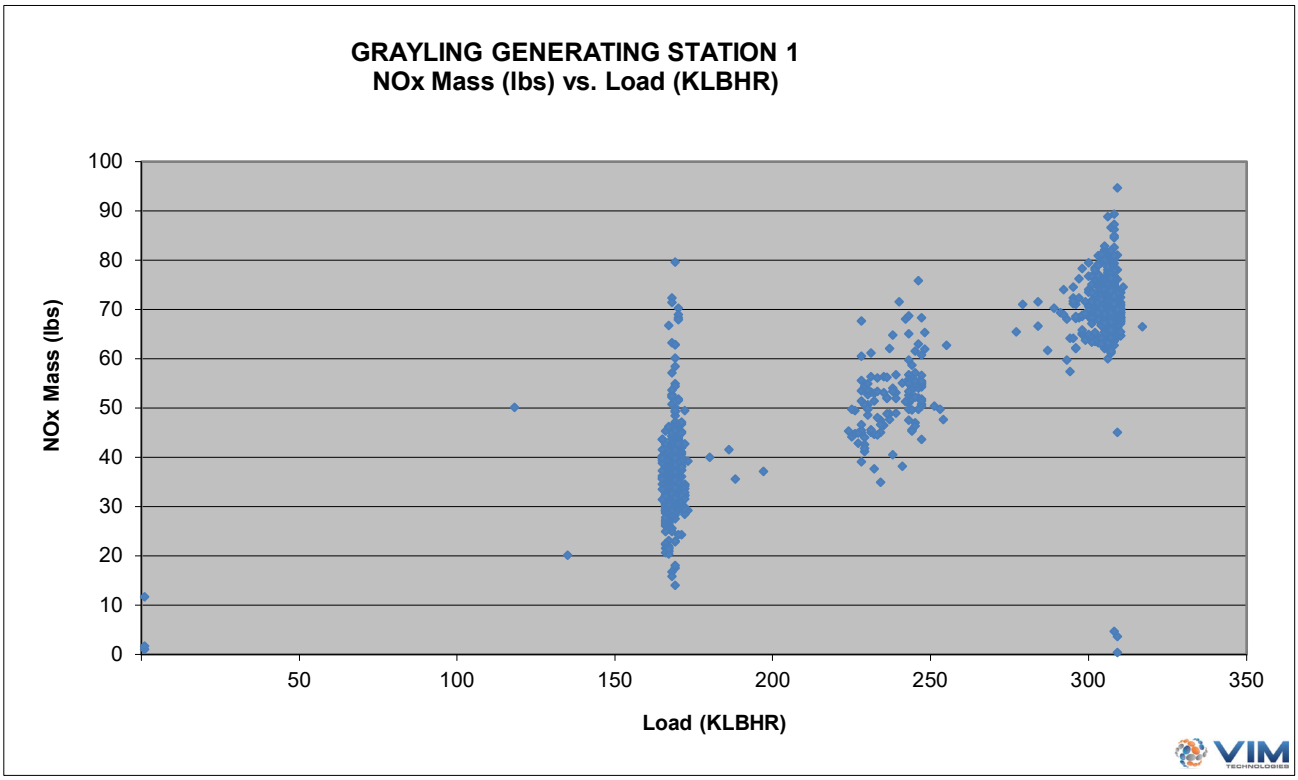
EDR Summary Data			
	Quarter	**Ozone Season**	**Year To Date**
QA Op Hours:	2,011	0	2,011
Op Time:	2,008.40	0.00	2,008.40
Heat Input:	714,129	0	714,129
NOx Mass:	46.7	0.0	46.7
NOx Rate:	N/A		N/A
SO2 Mass:	4.7		4.7
CO2 Mass:	N/A		N/A

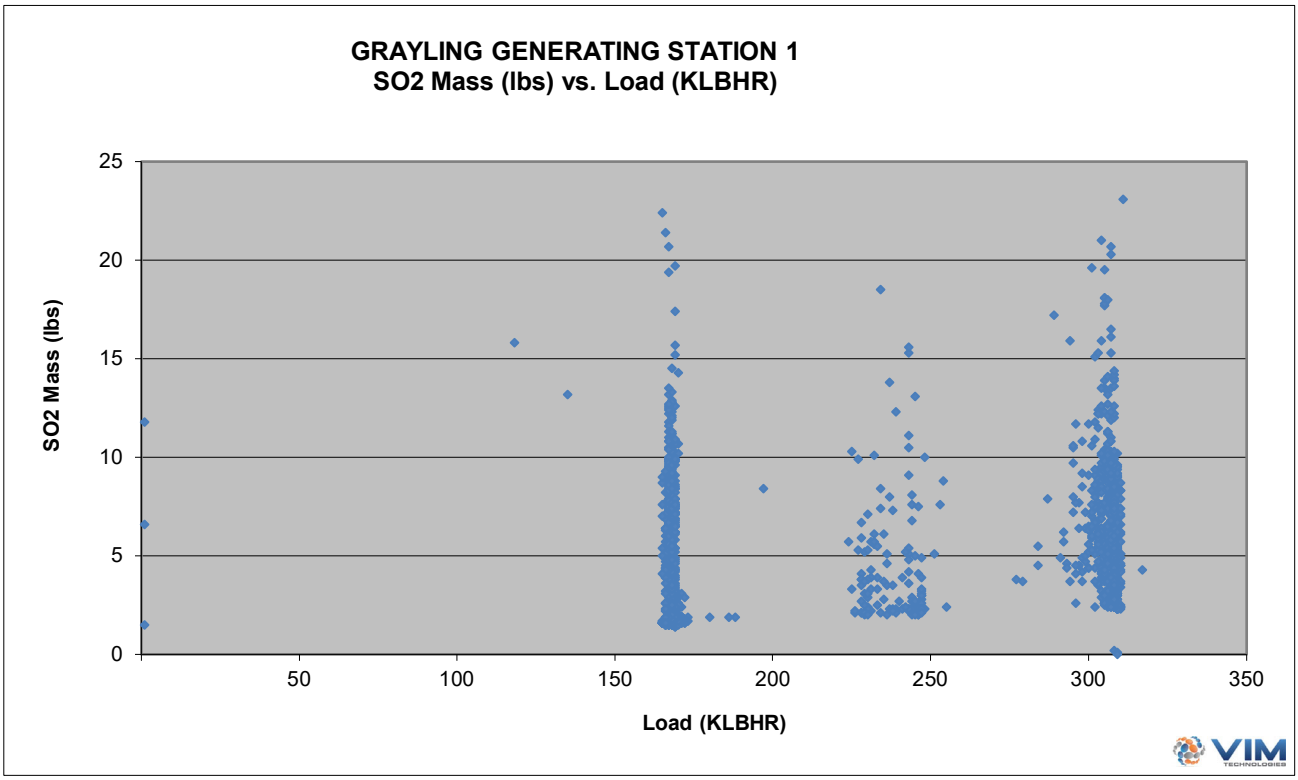
Statistical Correlations			
Diluent / Load:	91.3%	**Stack Flow / Load:**	90.9%
Heat Input / Load:	96.6%	**NOx Mass / Load:**	93.1%
NOx Rate / Load:	48.9%		
SO2 Mass / Load:	36.1%		
Unit Heat Input Rate:	1.674	**mmBtu/KLBHR**	

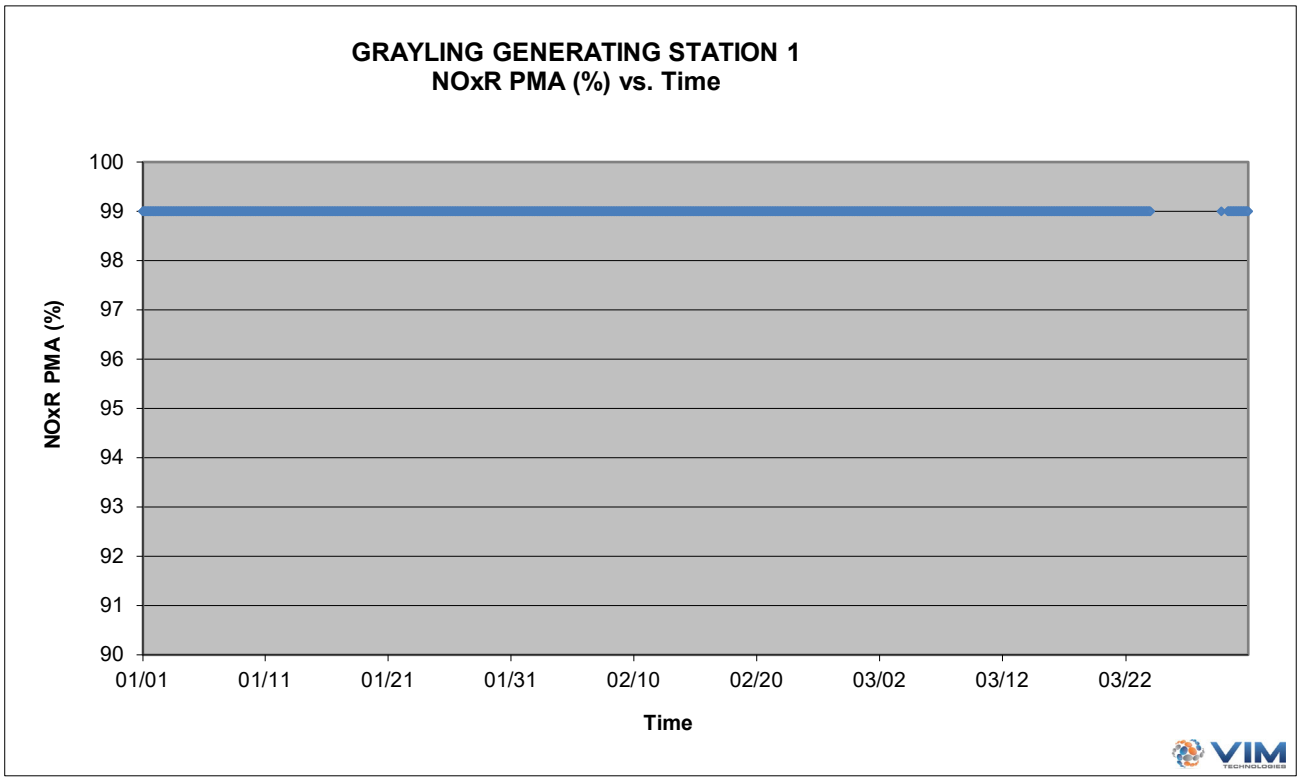


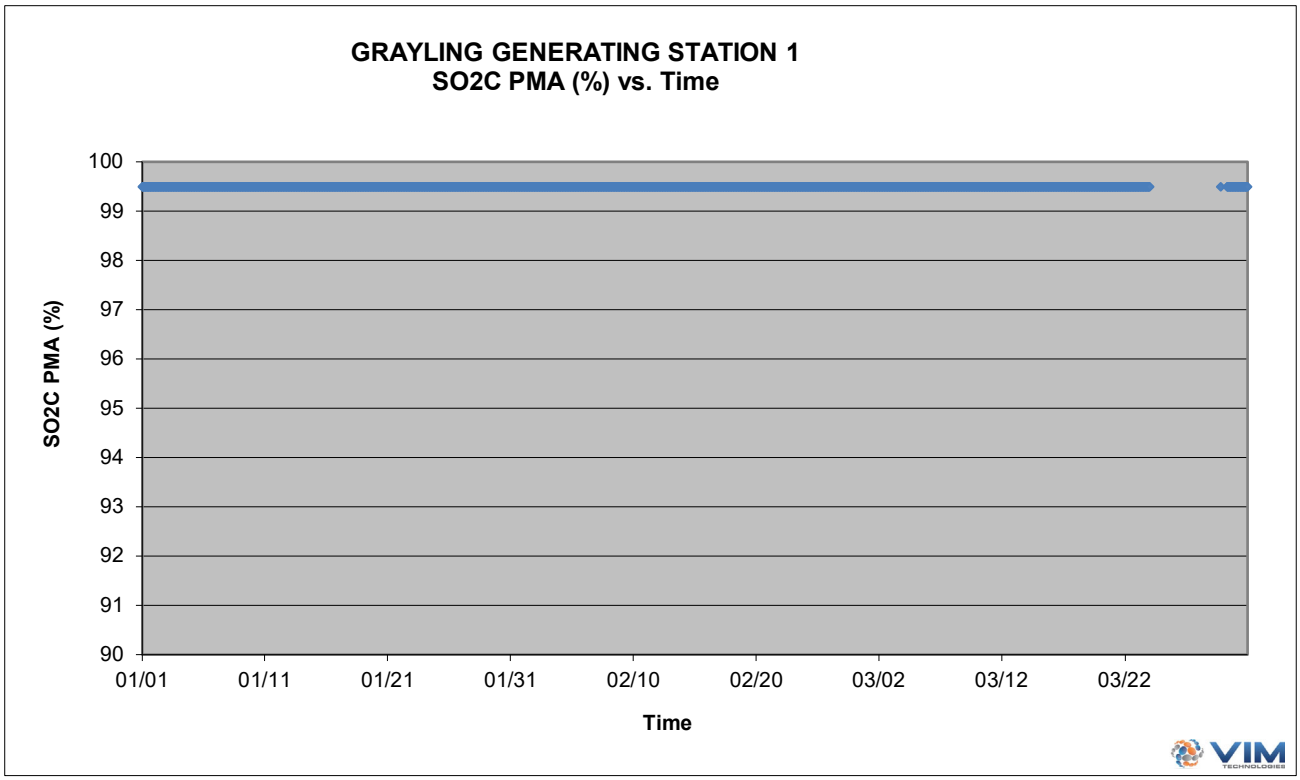


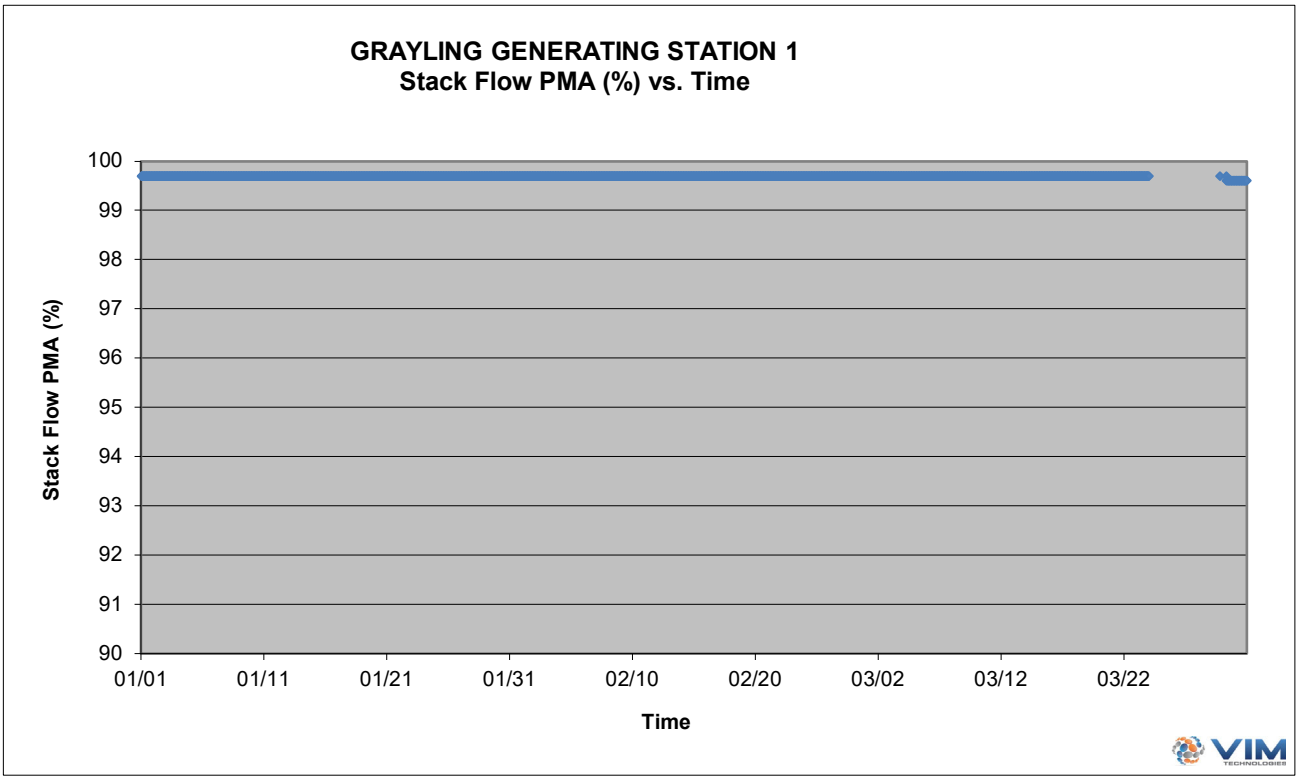


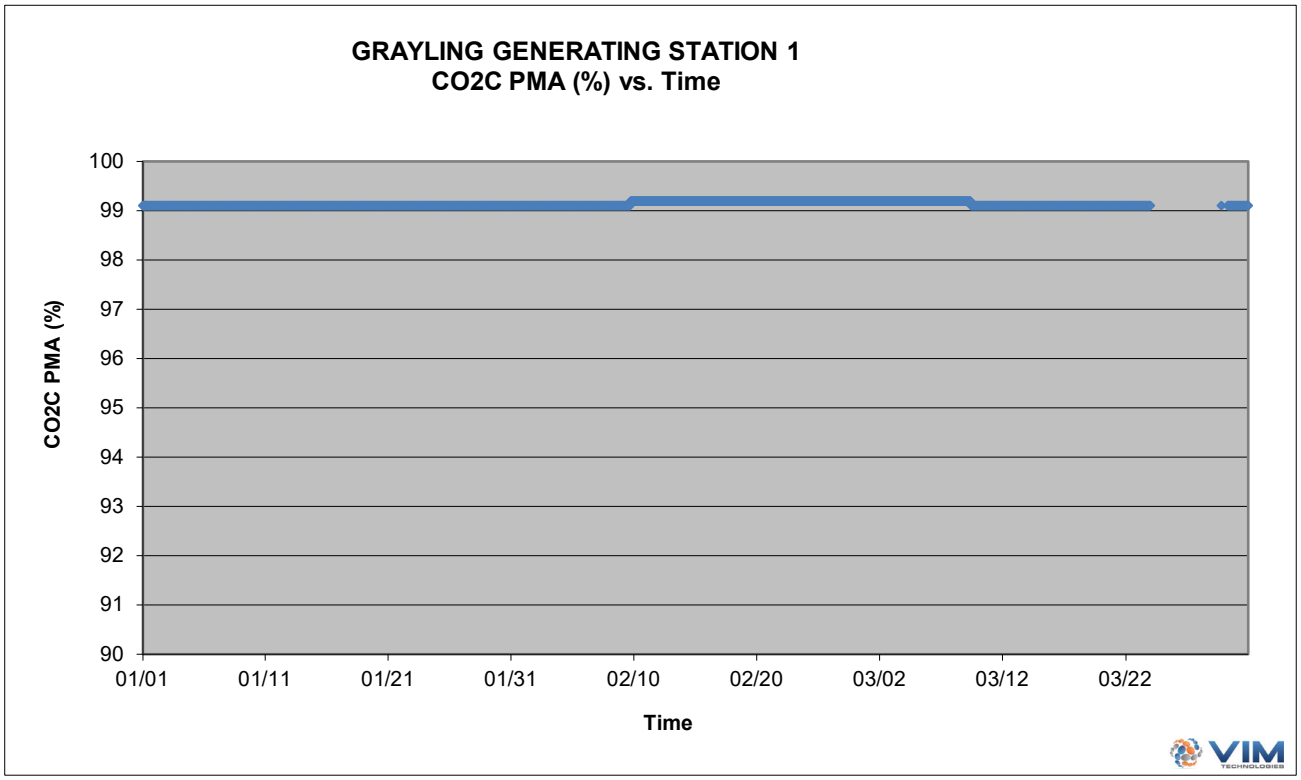


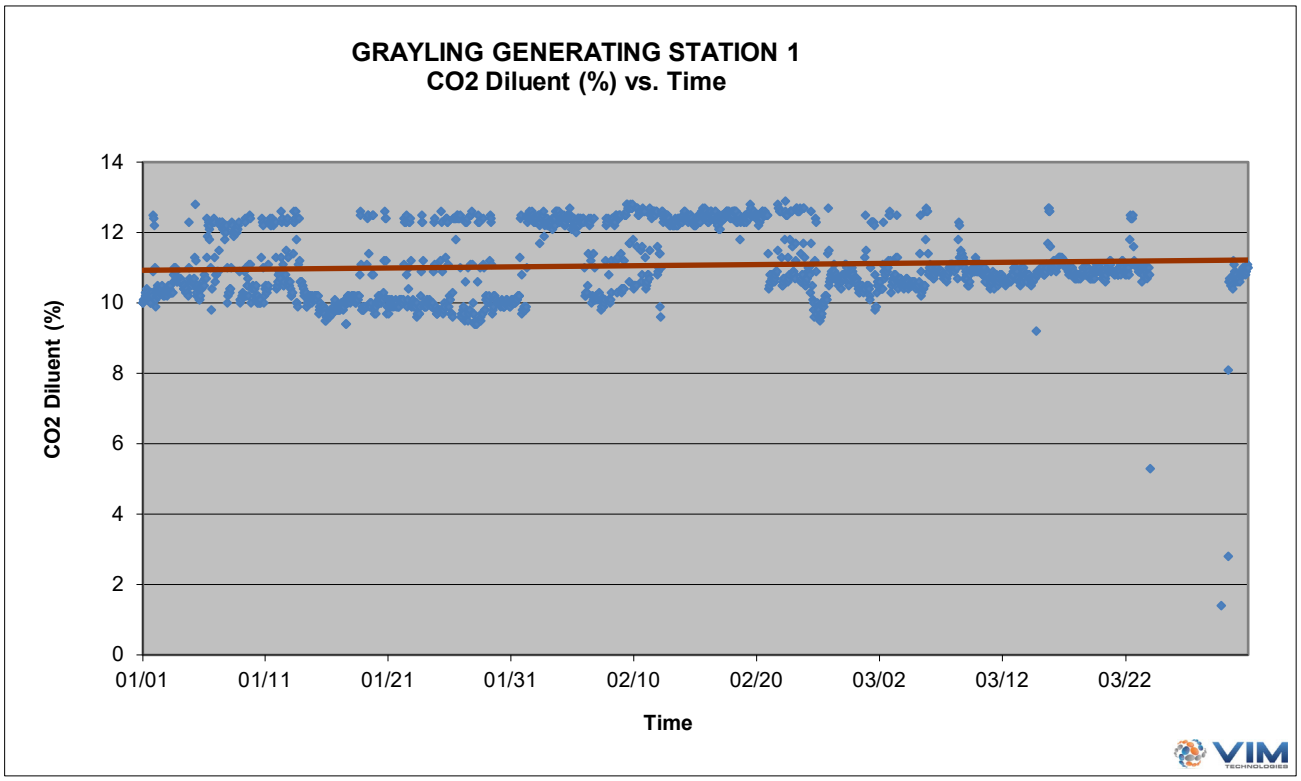




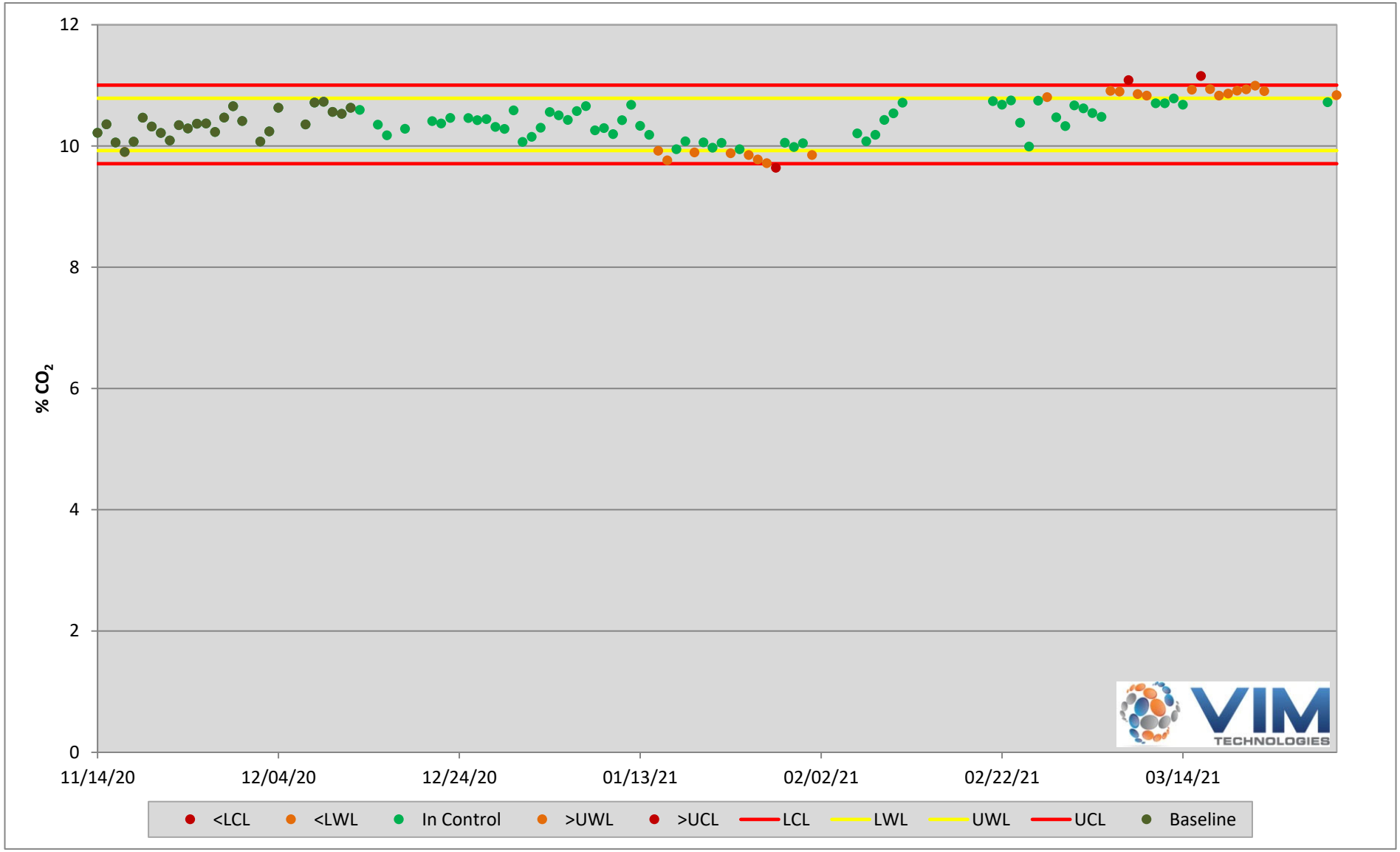







GRAYLING GENERATING STATION 1
CO2 Diluent (%) vs. Time
CO2 Diluent (%)
14
12
10
8
6
4
2
0
01/01
01/11
01/21
01/31
02/10
02/20
03/02
03/12
03/22
Time
VIM
TECHNOLOGIES

CO2 Control Chart: GRAYLING GENERATING STATION 1



RATA Date
11/13/2020

Load Bin
5

Consecutive Days	LCL	LWL	--	UWL	UCL
Outside Limits	1	4		9	1

ECMPS Client Tool

Version 1.* 2021 Q1

QA/Cert Test Evaluation Report

April 15, 2021 01:32 PM

Facility Name: Grayling Generating Station

Facility Details

Facility ID (ORISPL):	10822
Monitoring Plan Location IDs:	1
State:	MI
County:	Crawford County

Evaluation Results

Unit/Stack Identifier	Test Type	Test Number Test Date/Hour	Sys / Comp ID / Type	Result
1	F2LCHK	FL1-2021Q1-H 2021 Q1	FL1/FLOW	There are no errors
		FL1-2021Q1-L 2021 Q1	FL1/FLOW	There are no errors
	LINE	107-03092021 03/09/2021 10:22	107/CO2	There are no errors
		108-03092021 03/09/2021 10:22	108/NOX	There are no errors
		109-03092021 03/09/2021 10:22	109/SO2	There are no errors

ECMPS Client Tool

Version 1.* 2021 Q1

Emissions Evaluation Report

April 15, 2021 01:33 PM

Facility Name: Grayling Generating Station

Facility Details

Facility ID (ORISPL):	10822
Monitoring Plan Location IDs:	1
State:	MI
County:	Crawford County
Year/Quarter:	2021 Q1
Total Hours:	2160

Evaluation Results

There are no errors

Appendix E
Timeline of Events

Appendix E – Timeline of Events

October 2017
New FLOW CEMS installed during outage.

November 2017
Completed RATA, less than 10% RA qualifying for semi-annual RATA.

December 2017
Flow Monitor Re-certification sent to EGLE and EPA

March/April 2018
Received approval of 2017 RATA and Flow Monitor Certification from EGLE

May 2018
Passed all RATAs, less than 7.5% RA, qualifying for annual RATA

May 2019
Passed all RATAs, less than 7.5% RA, qualifying for annual RATA

November 2020
Passed all RATAs, less than 7.5% RA, qualifying for annual RATA; Conducted ROP testing for other specified pollutants

Feb 5, 2021
J. Howe of EGLE raised concern over flowrate comparisons during RATA and ROP testing completed in November

February 23, 2021
Meeting with EGLE regarding November testing observations, GGS presented case for potential causes of noted flow anomaly. Agreed to new flow RATA

April 26, 2021
Failed 3 run trial RATAs at low, mid, and high loads

April 29-May 3, 2021
Completed successful flow and gas RATA after adjustments to K-factor due to failed trial flow RATA runs. Submitted RATA report on 6/14/2021.

June 18, 2021
Violation Notice issued by EGLE for failure to maintain flow CEMs and for non-monitoring of required parameters. Requested response by July 9.

June 23, 2021
Meeting with EGLE to discuss VN

June 25, 2021
Requested extension to August 20; subsequently rejected by EGLE, however allowing an “initial response” by July 21, with full detail extension granted to August 20, 2021

July 28, 20201
EGLE issued a “Second Violation Notice”, citing an inadequate response even-though it was understood that full detail was not to be provided until August.

July 28, 2021
Email from J. Howe of EGLE explaining why the second violation notice was issued and clarifying EGLE’s main concern.

August 5, 2021
Meeting with EPA and EGLE to discuss flow monitor certification, QAQC, and mechanisms for data adjustment