COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
VALLEY REGIONAL OFFICE
P.O. Box 3000, Harrisonburg, Virginia 22801
(540) 574-7800 Fax (540) 574-7878
located at 4411 Early Road, Harrisonburg, VA
www.deq.virginia.gov

Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director

Amy Thatcher Owens
Regional Director

July 11, 2019

Mr. Mark H. Moore
Controller
Cardinal Energy Corporation
1330 Lynchburg Turnpike
Salem, Virginia 24153
via e-mail only: **mark_moore@cartermachinery.com**

Location: Frederick County
Registration No.: 80941

Dear Mr. Moore:

Attached is a permit to construct and operate a project involving six natural gas-fired engine-generator sets at 8209 Valley Pike, Middletown in accordance with the provisions of the Virginia State Air Pollution Control Board Regulations for the Control and Abatement of Air Pollution.

In the course of evaluating the application and arriving at a final decision to approve the project, the Department of Environmental Quality (DEQ) deemed the application complete on May 10, 2019.

This permit contains legally enforceable conditions. Failure to comply may result in a Notice of Violation and civil penalty. Please read all permit conditions carefully.

This permit approval to construct and operate shall not relieve Cardinal Energy Corporation of the responsibility to comply with all other local, state, and federal permit regulations.

The Board's Regulations as contained in Title 9 of the Virginia Administrative Code 5-170-200 provide that you may request a formal hearing from this case decision by filing a petition with the Board within 30 days after this case decision notice was mailed or delivered to you. Please consult the relevant regulations for additional requirements for such requests.

As provided by Rule 2A:2 of the Supreme Court of Virginia, you have 30 days from the date you actually received this permit or the date on which it was mailed to you, whichever occurred first, within which to initiate an appeal of this decision by filing a Notice of Appeal with:

David K. Paylor, Director
Department of Environmental Quality
P. O. Box 1105
Richmond, VA 23218

If this permit was delivered to you by mail, three days are added to the thirty-day period in which to file an appeal. Please refer to Part Two A of the Rules of the Supreme Court of Virginia, at http://www.courts.state.va.us/courts/scv/rules.html, for information on the required content of the Notice of Appeal and for additional requirements governing appeals from decisions of administrative agencies.

The proposed natural gas-fired generators appear to be subject to the following federal regulations: 40 CFR 60, Subpart JJJJ (40 CFR 60.4230 – 60.4248) and 40 CFR 63, Subpart ZZZZ (40 CFR 63.6580 – 63.6675). These federal requirements may be accessed using the electronic code of federal regulations website at http://www.ecfr.gov and selecting Title 40. The DEQ has not accepted delegation of these federal regulations from EPA and advises you to review these regulations to ensure compliance with applicable emission and operational limitations. As the owner/operator, you are responsible for complying with the monitoring, notification, reporting, and recordkeeping requirements of these regulations. Notifications shall be sent to EPA, Region III.

If you have any questions concerning this permit, please contact Debbie Medlin at 540-574-7809 or Debbie.Medlin@deq.virginia.gov.

Sincerely,

Janardan R. Pandey, P.E.
Air Permit Manager

Attachment: Permit

c: David Taylor, DEQ Air Compliance Inspector (via email)
Arthur B. Nunn, III – CTN, LLC (**art.nunn@ctn-online.com**)
File DEQ-VRO

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

STATIONARY SOURCE PERMIT TO CONSTRUCT AND OPERATE

In compliance with the Federal Clean Air Act and the Commonwealth of Virginia Regulations for the Control and Abatement of Air Pollution,

Cardinal Energy Corporation
1330 Lynchburg Turnpike
Salem, Virginia 24153
Registration No.: 80941

is authorized to construct and operate a project for:

six natural gas-fired engine-generator sets

located at

8209 Valley Pike
Middletown, Virginia

in accordance with the Conditions of this permit.

Approved on: July 11, 2019

Deputy Regional Director, Valley Region

Permit consists of 10 pages.
Permit Conditions 1 to 24.
Attachment A – Source Test Report Format, 1 page.

INTRODUCTION

This permit is based on the permit applications dated:

Application Signature Date	Application Amendment Date	Application Additional Information Received Date
January 29, 2019	February 28, 2019 March 1, 2019 May 10, 2019	February 5, 2019 April 15, 2019 April 30, 2019

Any changes in the permit application specifications or any existing facilities which alter the impact of the facility on air quality may require a permit. Failure to obtain such a permit prior to construction may result in enforcement action. In addition, this facility may be subject to additional applicable requirements not listed in this permit.

Words or terms used in this permit shall have meanings as provided in 9 VAC 5-10-10 of the State Air Pollution Control Board Regulations for the Control and Abatement of Air Pollution. The regulatory reference or authority for each condition is listed in parentheses () after each condition.

Annual requirements to fulfill legal obligations to maintain current stationary source emissions data will necessitate a prompt response by the permittee to requests by the DEQ or the Board for information to include, as appropriate: process and production data; changes in control equipment; and operating schedules. Such requests for information from the DEQ will either be in writing or by personal contact.

The availability of information submitted to the DEQ or the Board will be governed by applicable provisions of the Freedom of Information Act, §§ 2.2-3700 through 2.2-3714 of the Code of Virginia, § 10.1-1314 (addressing information provided to the Board) of the Code of Virginia, and 9 VAC 5-170-60 of the State Air Pollution Control Board Regulations. Information provided to federal officials is subject to appropriate federal law and regulations governing confidentiality of such information.

Equipment List - Equipment at this facility consists of the following:

Equipment to be Constructed:			
Reference No.	**Equipment Description**	**Rated Capacity**	**Federal Requirements**
Gen1	Caterpillar G3520H Natural Gas-Fired Engine-Generator set	3448 bhp/ 2485 kW	---
Gen2	Caterpillar G3520H Natural Gas-Fired Engine-Generator set	3448 bhp/ 2485 kW	---
Gen3	Caterpillar G3520H Natural Gas-Fired Engine-Generator set	3448 bhp/ 2485 kW	---

Gen4	Caterpillar 3520H Natural Gas-Fired Engine-Generator set	3448 bhp/ 2485 kW	---
Gen5	Caterpillar 3520H Natural Gas-Fired Engine-Generator set	3448 bhp/ 2485 kW	---
Gen6	Caterpillar 3520H Natural Gas-Fired Engine-Generator set	3448 bhp/ 2485 kW	---

Equipment Previously Exempted from Permitting		
Reference No.	**Equipment Description**	**Rated Capacity**
--	Kohler Diesel-Fired Emergency Generator	1600 kW
--	Burnham Dual Fuel-Fired Boiler (natural gas (NG) and distillate oil (DO))	2.22 MMBtu/hr (NG) 1.78 MMBtu/hr (DO)

Specifications provided above are for informational purposes only and do not form enforceable terms or conditions of the permit.

PROCESS REQUIREMENTS

1. **Emission Controls –** Carbon monoxide (CO) and volatile organic compounds (VOC) emissions from each engine-generator set (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6) shall be controlled by the use of an engine oxidation catalyst and good operating practices. Each engine oxidation catalyst shall be provided with adequate access for inspection and shall be in operation when the associated engine-generator set is operating.
   (9 VAC 5-80-1180 and 9 VAC 5-50-260)

2. **Emission Controls –** Nitrogen oxides (NOx) from each engine-generator set (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6) shall be controlled by proper engine operation in accordance with the manufacturer's written instructions or procedures developed by the permittee or the manufacturer over the life of the engine. In addition, the permittee may only change those settings that are approved by the manufacturer and that do not increase air emissions, in a manner consistent with good air pollution control practices for minimizing emissions.
   (9 VAC 5-80-1180 and 9 VAC 5-50-260)

3. **Monitoring Devices (Nonresettable Hour Meter)** – Each engine-generator set (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6) shall be equipped with a non-resettable hour metering device to monitor the operating hours. The non-resettable hour meter used to continuously measure the hours of operation for each engine-generator set shall be observed by the permittee with a frequency of not less than once each day the engine-generator set is operated. If the non-resettable hour meter is found to be operating in a manner inconsistent

with the manufacturer's written requirements or recommendations, timely corrective action shall be taken. The permittee shall keep a log of these observations, including details of any corrective actions taken.

Each monitoring device shall be installed, maintained, calibrated (as appropriate) and operated in accordance with approved procedures, which shall include, as a minimum, the manufacturer's written requirements or recommendations. Each monitoring device shall be provided with adequate access for inspection and shall be in operation when the associated engine-generator set is operating.
(9 VAC 5-80-1180 D)

4. **Monitoring Devices (Oxidation Catalyst Bed Temperature)** – Each engine-generator set (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6) shall be equipped with a device to continuously measure and record the oxidation catalyst bed temperature at a minimum frequency of once every fifteen minutes during the operation of each engine-generator set. The information shall be correlated to run date, engine load / kilowatt output, and engine operating hours. If the monitoring device is found to be operating in a manner inconsistent with the manufacturer's written requirements or recommendations, timely corrective action shall be taken. The permittee shall keep a log of these observations. The permittee shall also keep a log of all corrective actions taken.

   Each monitoring device shall be installed, maintained, calibrated and operated in accordance with approved procedures which shall include, as a minimum, the manufacturer's written requirements or recommendations. Each monitoring device shall be provided with adequate access for inspection and shall be in operation when the associated engine-generator set is operating.
   (9 VAC 5-80-1180 D)

OPERATING LIMITATIONS

5. **Fuel** – The approved fuel for each engine-generator set (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6) is natural gas. A change in the fuel shall be considered a change in the method of operation and may require a new or amended permit. However, if a change in the fuel is not subject to new source review permitting requirements, this condition should not be construed to prohibit such a change.
   (9 VAC 5-80-1180)

6. **Operating Hours** – Each engine-generator set (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6) shall not operate for more than 1,800 hours per year, calculated monthly as the sum of each consecutive 12-month period. Compliance for the consecutive 12-month period shall be demonstrated monthly by adding the total for the most recently completed calendar month to the individual monthly totals for the preceding 11 months for each engine-generator set.
   (9 VAC 5-80-1180 and 9 VAC 5-60-260)

EMISSION LIMITS

7. **Emission Limits** – Emissions from the operation of each engine-generator set (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6) shall not exceed the limits specified below:

Nitrogen Oxides (as NO_2)	5.32	lbs/hr	4.8	tons/yr
Carbon Monoxide	0.99	lbs/hr	0.9	tons/yr
VOC	1.22	lbs/hr	1.1	tons/yr

Annual emissions shall be calculated monthly as the sum of each consecutive 12-month period. These emissions are derived from the estimated overall emission contribution from operating limits. Exceedance of the operating limits may be considered credible evidence of the exceedance of emission limits. Compliance with these emission limits may be determined as stated in Conditions 1 and 5.
(9 VAC 5-80-1180 and 9 VAC 5-50-260)

8. **Visible Emission Limit** – Visible emissions from each engine-generator set exhaust (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6) shall not exceed five percent opacity as determined by 40 CFR 60, Appendix A, Method 9. This condition applies at all times except during startup, shutdown, and malfunction.
(9 VAC 5-80-1180)

9. **Emissions Testing** – The facility shall be constructed so as to allow for emissions testing upon reasonable notice at any time, using appropriate methods. This includes constructing the facility such that volumetric flow rates and pollutant emission rates can be accurately determined by applicable test methods and providing a stack or duct that is free from cyclonic flow. Sampling ports, safe sampling platforms, and access at the appropriate locations shall be provided when requested.
(9 VAC 5-50-30 F and 9 VAC 5-80-1180)

RECORDS

10. **On Site Records** – The permittee shall maintain records of emissions data and operating parameters as necessary to demonstrate compliance with this permit. The content and format of such records shall be arranged with the DEQ. These records shall include, but are not limited to:

    a. The manufacturer's written operating instructions or procedures developed by the owner/operator that are approved by the engine/device manufacturer for each engine-generator set, as required by Condition 2.

    b. Logs of observations and any corrective actions taken for each non-resettable hour meter, as required by Condition 3.

c. Logs of observations and any corrective actions taken for devices to continuously measure and record the oxidation catalyst bed temperature, as required by Condition 4.

d. Monthly and annual hours of operation of each engine-generator set (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6), calculated monthly as required by Condition 6.

e. Monthly and annual emissions from each engine-generator set (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6), calculated monthly as required by Condition 7.

f. Engine information including make, model, serial number, model year, maximum engine power (bhp), and engine displacement for each engine-generator set (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6).

g. Results of all stack tests and VEE, as required by Conditions 11, 12, 13, and 14.

h. Records of maintenance, operating procedures, and training as required by Condition 19.

i. Records of bypass, malfunction, shutdown or failure of the facility or its associated air pollution control equipment, as required by Condition 20.

These records shall be available for inspection by the DEQ and shall be current for the most recent five years.
(9 VAC 5-80-1180 and 9 VAC 5-50-50)

INITIAL COMPLIANCE DETERMINATION

11. **Stack Test** – Initial performance tests shall be conducted on the stack for each of the engine-generator sets (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6) to determine compliance with the emission limits for NOx, CO, and VOC contained in Condition 7.

    The tests shall be performed, reported and demonstrate compliance within 60 days after achieving the maximum production rate at which the facility will be operated but in no event later than 180 days after start-up of the permitted facility. The tests shall be conducted and reported and data reduced as set forth in 9 VAC 5-50-30, and also shall be consistent with the test methods and procedures contained in 40 CFR 60, Subpart JJJJ. The details of the tests are to be arranged with the DEQ. The permittee shall submit a test protocol at least 30 days prior to testing. One copy of the test results shall be submitted to the DEQ within 45 days after test completion and shall conform to the test report format enclosed with the permit.
    (9 VAC 5-50-30 and 9 VAC 5-80-1200)

12. **Visible Emission Evaluation –** Concurrently with the initial performance test, the permittee shall also conduct Visible Emission Evaluations (VEE) in accordance with 40 CFR Part 60, Appendix A, Method 9, on the six engine-generator sets (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6). Each test shall consist of ten sets of 24 consecutive observations (at 15 second intervals) to yield a six minute average. The details of the tests are to be arranged with the DEQ. The permittee shall submit a test protocol at least 30 days prior to testing. The evaluation shall be performed, reported, and demonstrate compliance within 60 days

after achieving the maximum production rate at which the facility will be operated, but in no event later than 180 days after start-up of the permitted facility. One copy of the test result shall be submitted to the DEQ within 45 days after test completion, and shall conform to the test report format enclosed with this permit.
(9 VAC 5-50-30 and 9 VAC 5-80-1200)

CONTINUING COMPLIANCE DETERMINATION

13. **Stack Tests** – The permittee shall repeat the performance tests contained in Condition 11 every three years or 8,760 hours of operation of each engine-generator set (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6), whichever is earliest.

    The permittee shall submit a test protocol at least 30 days prior to testing. Testing shall conform to the test report format enclosed with this permit. One copy of the test results shall be submitted to the DEQ within 60 days after completion of the testing. Other details of the test shall be arranged with the DEQ.
    (9 VAC 5-80-1200 and 9 VAC 5-50-30 G)

14. **Visible Emissions Evaluation** – Upon request by the DEQ, the permittee shall conduct visible emission evaluations from the engine-generator sets (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6) to demonstrate compliance with the visible emission limits contained in this permit. The details of the tests shall be arranged with the DEQ.
    (9 VAC 5-80-1200 and 9 VAC 5-50-30 G)

NOTIFICATIONS

15. **Initial Notifications** – The permittee shall furnish written notification to the DEQ of:

    a. The actual date on which construction of each engine-generator set (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6) commenced within 30 days after such date. This notification must also include the anticipated start-up date of the respective engine-generator set;

    b. The anticipated start-up date of the engine-generator sets (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6) postmarked not more than 60 days nor less than 30 days prior to such date.

    c. The actual start-up date of each engine-generator set (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6) within 15 days after such date. The actual start-up date shall be the date on which each engine completes manufacturer's trials, but shall be no later than thirty days after the initial start-up for manufacturer's trials.

    d. The anticipated date of the performance tests of the engine-generator sets (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6) postmarked at least 30 days prior to such date.

    (9 VAC 5-80-1180 and 9 VAC 5-50-50)

GENERAL CONDITIONS

16. **Permit Invalidation** – This permit to construct and operate the engine-generator sets (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6) shall become invalid, unless an extension is granted by the DEQ, if:

    a. A program of continuous construction is not commenced within 18 months from the date of this permit; or

    b. A program of construction is discontinued for a period of 18 months or more, or is not completed within a reasonable time, except for a DEQ approved period between phases of a phased construction project.

    (9 VAC 5-80-1210)

17. **Permit Suspension/Revocation** – This permit may be suspended or revoked if the permittee:

    a. Knowingly makes material misstatements in the permit application or any amendments to it;

    b. Fails to comply with the conditions of this permit;

    c. Fails to comply with any emission standards applicable to a permitted emissions unit;

    d. Causes emissions from the stationary source which result in violations of, or interferes with the attainment and maintenance of, any ambient air quality standard; or

    e. Fails to operate in conformance with any applicable control strategy, including any emission standards or emission limitations, in the State Implementation Plan in effect at the time an application for this permit is submitted.

    (9 VAC 5-80-1210 G)

18. **Right of Entry** – The permittee shall allow authorized local, state, and federal representatives, upon the presentation of credentials:

    a. To enter upon the permittee's premises on which the facility is located or in which any records are required to be kept under the terms and conditions of this permit;

    b. To have access to and copy at reasonable times any records required to be kept under the terms and conditions of this permit or the State Air Pollution Control Board Regulations;

    c. To inspect at reasonable times any facility, equipment, or process subject to the terms and conditions of this permit or the State Air Pollution Control Board Regulations; and

    d. To sample or test at reasonable times.

For purposes of this condition, the time for inspection shall be deemed reasonable during regular business hours or whenever the facility is in operation. Nothing contained herein shall make an inspection time unreasonable during an emergency.
(9 VAC 5-170-130 and 9 VAC 5-80-1180)

19. **Maintenance/Operating Procedures** – At all times, including periods of start-up, shutdown, and malfunction, the permittee shall, to the extent practicable, maintain and operate the affected source, including associated air pollution control equipment, in a manner consistent with good air pollution control practices for minimizing emissions.

    The permittee shall take the following measures in order to minimize the duration and frequency of excess emissions, with respect with respect to the operation of the engine-generator sets (Ref. Gen1, Gen2, Gen3, Gen4, Gen5, and Gen6):

    a. Develop a maintenance schedule and maintain records of all scheduled and non-scheduled maintenance;

    b. Maintain an inventory of spare parts;

    c. Have available written operating procedures for equipment. These procedures shall be based on the manufacturer's recommendations, at a minimum; and

    d. Train operators in the proper operation of all such equipment and familiarize the operators with the written operating procedures, prior to their first operation of such equipment. The permittee shall maintain records of the training provided including the names of trainees, the date of training and the nature of the training.

    (9 VAC 5-50-20 E and 9 VAC 5-80-1180 D)

20. **Record of Malfunctions** – The permittee shall maintain records of the occurrence and duration of any bypass, malfunction, shutdown or failure of the facility or its associated air pollution control equipment that results in excess emissions for more than one hour. Records shall include the date, time, duration, description (emission unit, pollutant affected, cause), corrective action, preventive measures taken and name of person generating the record.
    (9 VAC 5-20-180 J and 9 VAC 5-80-1180 D)

21. **Notification for Facility or Control Equipment Malfunction** – The permittee shall furnish notification to the DEQ of malfunctions of the affected facility or related air pollution control equipment that may cause excess emissions for more than one hour. Such notification shall be made as soon as practicable but no later than four daytime business hours after the malfunction is discovered. The permittee shall provide a written statement giving all pertinent facts, including the estimated duration of the breakdown, within two weeks of discovery of the malfunction. When the condition causing the failure or malfunction has been corrected and the equipment is again in operation, the permittee shall notify the DEQ.
    (9 VAC 5-20-180 C and 9 VAC 5-80-1180)

22. **Violation of Ambient Air Quality Standard** – The permittee shall, upon request of the DEQ, reduce the level of operation or shut down a facility, as necessary to avoid violating any primary ambient air quality standard and shall not return to normal operation until such time as the ambient air quality standard will not be violated.
(9 VAC 5-20-180 I and 9 VAC 5-80-1180)

23. **Change of Ownership** – In the case of a transfer of ownership of a stationary source, the new owner shall abide by any current permit issued to the previous owner. The new owner shall notify the DEQ of the change of ownership within 30 days of the transfer.
(9 VAC 5-80-1240)

24. **Permit Copy** – The permittee shall keep a copy of this permit on the premises of the facility to which it applies.
(9 VAC 5-80-1180)

SOURCE TESTING REPORT FORMAT

Report Cover

1. Plant name and location
2. Units tested at source (indicate Ref. No. used by source in permit or registration)
3. Test Dates.
4. Tester; name, address and report date

Certification

1. Signed by team leader/certified observer (include certification date)
2. Signed by responsible company official
3. *Signed by reviewer

Copy of approved test protocol

Summary

1. Reason for testing
2. Test dates
3. Identification of unit tested & the maximum rated capacity
4. *For each emission unit, a table showing:
   a. Operating rate
   b. Test Methods
   c. Pollutants tested
   d. Test results for each run and the run average
   e. Pollutant standard or limit
5. Summarized process and control equipment data for each run and the average, as required by the test protocol
6. A statement that test was conducted in accordance with the test protocol or identification & discussion of deviations, including the likely impact on results
7. Any other important information

Source Operation

1. Description of process and control devices
2. Process and control equipment flow diagram
3. Sampling port location and dimensioned cross section Attached protocol includes: sketch of stack (elevation view) showing sampling port locations, upstream and downstream flow disturbances and their distances from ports; and a sketch of stack (plan view) showing sampling ports, ducts entering the stack and stack diameter or dimensions

Test Results

1. Detailed test results for each run
2. *Sample calculations
3. *Description of collected samples, to include audits when applicable

Appendix

1. *Raw production data
2. *Raw field data
3. *Laboratory reports
4. *Chain of custody records for lab samples
5. *Calibration procedures and results
6. Project participants and titles
7. Observers' names (industry and agency)
8. Related correspondence
9. Standard procedures

* Not applicable to visible emission evaluation