COMMONWEALTH OF VIRGINIA

Department of Environmental Quality

Subject:	**APG-576 – Diesel Engine-Generator Set Procedure for Writing New and Modified Permits**
To:	**Michael Rolband, DEQ Executive Director**
From:	**Michael Dowd, Air and Renewable Energy Division Director**
Date:	**December 29, 2025**
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Summary:
This revision to DEQ Guidance Memo APG-576 (last updated December 2012), the Diesel Engine-Generator Set Procedure for Writing New and Modified Permits (gen-sets), creates new sections of the existing document that address presumptive Best Available Control Technology (BACT) and performance testing requirements specific to emergency and non-emergency gen-sets located at data center stationary sources. Based upon recent DEQ permitting and compliance experience as described more fully in the revised guidance, the presumptive BACT for both emergency and non-emergency gen-sets located as data centers is now based on the use of a selective catalytic reduction (SCR) system or equivalent for nitrogen oxides control, a diesel oxidation catalyst system or equivalent for carbon monoxide control and a diesel particulate filter (DPF) or equivalent for particulate matter control. Collectively, this suite of air pollution control systems is sometimes known as Tier 4-equivalent. In order to allow the regulated community sufficient notice of the updated BACT requirements, the revised document specifies the updated BACT requirements for emergency and non-emergency diesel gen-sets located at data centers will be applicable to air permit applications received on or after July 1, 2026.

The presumptive BACT requirements for diesel gen-sets located at non-data center stationary sources remain unchanged.

Electronic Copy:
Once effective, an electronic copy of this guidance will be available on:

- The Virginia Regulatory Town Hall under the Department of Environmental Quality (http://www.townhall.virginia.gov/L/gdocs.cfm?agencynumber=440);
- The Department's website at https://www.deq.virginia.gov/news-info/shortcuts/permits/air/issued-air-permits-for-data-centers

Contact Information:
Please contact Stanley Faggert, ((804) 664-3464. Stanley.faggert@deq.virginia.gov) with any questions regarding the application of this guidance.

Certification:
As required by Subsection B of § 2.2-4002.1 of the APA, the agency certifies that this guidance document conforms to the definition of a guidance document in § 2.2-4101 of the Code of Virginia.

Disclaimer:
This document is provided as guidance and, as such, sets forth standard operating procedures for the agency. However, it does not mandate or prohibit any particular action not otherwise required or prohibited by law or regulation. If alternative proposals are made, such proposals will be reviewed and accepted or denied based on their technical adequacy and compliance with appropriate laws and regulations.

Permit Boilerplate Procedures For
DIESEL ENGINE-GENERATOR SETS

A. Purpose:

The purpose of this document is to specify requirements for permit approval for emergency and non-emergency diesel engine-generator sets. **This boilerplate is only for electrical generation engines.** This boilerplate does not apply to diesel engine-generator sets subject to Prevention of Significant Deterioration (PSD) or Non-attainment permit review. The boilerplate is meant to provide a guideline for the minimum requirements of the Virginia Department of Environmental Quality (DEQ). More stringent requirements may be imposed if necessary to demonstrate compliance with National Ambient Air Quality Standards (NAAQS) or other special requirements.

****Note:** Virginia currently has two General Permits (GPs) for engine-generator sets: (1) Emergency Generator GP (2) Voluntary Demand Response Generator GP. The facility has the option of getting a general permit or going through the regular minor new source review (NSR) permitting process.

B. Definitions:

The following definitions are for use in this permit boilerplate and procedure and do not necessarily have the same meaning in other portions of the regulations.

Ammonia Slip – Ammonia that is not adsorbed in the selective catalytic reduction (SCR) catalyst and is carried out with the exhaust. Typically expressed in parts per million (ppm) at a specified O_2 correction (15% United States, 5% Europe).

Bus Setup - A setup of engine-generator sets where all the engines are grouped together into pods and load is not shared (i.e. 5 engines go towards building A and 6 engines go towards building B, etc.).

Closed Loop SCR – An SCR control system that uses active measurement of nitrogen oxide (NO_X) concentration to adjust the ammonia or urea injection rate. NO_X concentration is measured after the SCR catalyst through the use of a NO_X sensor.

Compression Ignition (CI) Engine - A type of stationary internal combustion engine that is not a spark ignition engine. A diesel engine is a CI engine.

Data Center – A facility primarily engaged in providing computing infrastructure, data processing services, web hosting and related services, including streaming support services. This also includes, but is not limited to, facilities involved in artificial intelligence use/development and cryptocurrency processing. Data processing services entail complete processing and specialized reports from data supplied by clients or provide automated data processing and data entry services. The data center-specific Best Available Control Technology (BACT) provisions of this guidance document will be applied to all applications submitted to DEQ on or after July 1, 2026.

Demand Response - Measures aimed at shifting time of use of electricity from peak-use periods to times of lower demand by inducing retail customers to curtail electricity usage during periods of congestion and higher prices in the electrical grid. Demand response actions are typically undertaken by the source owner in response to a request from a utility or electrical grid system operator or in response to market prices. Demand response participants do not include affected units that are participating in an ISO's Manual 13 Emergency Operations program.

Diesel Fuel - Any liquid obtained from the distillation of petroleum with a boiling point of approximately 150 to 360 degrees Celsius. One commonly used form is number 2 distillate oil.

Diesel Oxidation Catalyst (DOC) - A flow through exhaust device that contains a honeycomb structure covered with a layer of chemical catalyst. This layer contains small amounts of precious metal (usually platinum or palladium) that interact with and oxidize pollutants in the exhaust stream (CO and unburned HCs); therefore, reducing carbon monoxide (CO) emissions.

Diesel Particulate Filter (DPF) – An emission control technology that reduces particulate matter (PM) emissions by trapping the particles in a flow filter substrate and periodically removes the collected particles by either physical action or by oxidizing (burning off) the particles in a process called regeneration.

Emergency[1] - A condition that arises from sudden and reasonably unforeseeable events where the primary energy or power source is disrupted or disconnected due to conditions beyond the control of an owner or operator of a source including any of the following:

a. A failure of the electrical grid.

b. On-site disaster or equipment failure.

c. Public service emergencies such as flood, fire, natural disaster, or severe weather conditions.

d. An Independent System Operator (ISO) declared emergency, where an ISO emergency is any of the following:
    (i) An abnormal system condition requiring manual or automatic action to maintain system frequency, to prevent loss of firm load, equipment damage, or tripping of system elements that could adversely affect the reliability of an electric system or the safety of persons or property.
    (ii) Capacity deficiency or capacity excess conditions.
    (iii) A fuel shortage requiring departure from normal operating procedures in order to minimize the use of such scarce fuel.
    (iv) Abnormal natural events or man-made threats that would require conservative operations to posture the system in a more reliable state.
    (v) An abnormal event external to the ISO service territory that may require ISO action.

Emergency engine-generator set (emergency gen-set) – an engine-generator set that only operates as specified in 9VAC5-80-1105B.2 and 9VAC5-80-1111 (if applicable). It should be noted that the United States Environmental Protection Agency (EPA) utilizes a different set of operational requirements to define emergency engines. This is, at least in part, due to the difference between EPA's purpose (to require control technologies) and NSR's purpose (to ensure air quality). EPA's definition may not be used to determine permit applicability or requirements except as noted in this document.

[1] To the extent this definition differs from the definition of *emergency* included in any future version of 9VAC5-80-1110, the regulatory definition shall take precedence. The reader should also note any DEQ guidance relevant to the definition or interpretation of this term.

Engine-generator set - The combination of an electrical generator and an engine mounted together to form a single piece of equipment. This combination is also called a gen-set. In many contexts, the engine is taken for granted and the combined unit is simply called a generator.

Independent System Operator (ISO) - A person that may receive or has received, by transfer pursuant to § 56-576 of the Code of Virginia, any ownership or control of, or any responsibility to operate, all or part of the transmission systems in the Commonwealth.

kW_e – The electrical output of the generator in units of kilowatts.

Load Curtailment - An action similar to demand response, with the specific removal or reduction of electrical loads for a limited period of time from a utility grid system in response to a request from the utility or electrical grid system operator.

Load Map - A document that is specific to each SCR which shows the load vs. urea/ammonia solution ratio that is needed to achieve a specified amount of NO_X reduction. This document is created during commissioning of each unit.

Non-emergency engine-generator set (non-emergency gen-set) – any engine-generator set that is not an emergency engine-generator set.

Open Looped SCR – An SCR control system that has no NO_X feedback where ammonia/urea injection is based on a unit's load map instead of a NO_X sensor.

Parallel Setup – A setup of engine-generator sets where all the engines are linked into one central electrical line and share load.

Peak Shaving - Measures aimed solely at shifting time of use of electricity from peak-use periods to times of lower demand by inducing retail customers to curtail electricity usage during periods of congestion and higher prices in the electrical grid. Peak shaving is typically undertaken at a source owner's discretion in order to reduce maximum electrical usage and, therefore, cost of electrical service to the source owner. Peak shaver engines are **not** emergency engines.

Selective Catalytic Reduction (SCR) – A control device that reduces the exhaust gas concentration of NO_X by injecting an ammonia solution or urea into the exhaust gas stream, which in the presence of a catalyst, reacts with the NO_X to form nitrogen gas and water vapor.

Spark Ignition (SI) Engine – A natural gas or liquefied petroleum gas fueled engine or any other type of engine with a spark plug (or other sparking device) and with operating characteristics significantly similar to the theoretical Otto combustion cycle. Spark ignition engines usually use a throttle to regulate intake air flow to control power during normal operation. Dual-fuel engines in which a liquid fuel (typically diesel fuel) is used for compression ignition and gaseous fuel (typically natural gas) is used as the primary fuel at an annual average ratio of less than 2 parts diesel fuel to 100 parts total fuel on an energy equivalent basis are spark ignition engines.

Stationary Internal Combustion Engine (ICE) means any internal combustion engine, except combustion turbines, that converts heat energy into mechanical work and is not mobile. Stationary ICEs differ from mobile ICE in that a stationary internal combustion engine is not a non-road engine as defined at 40 CFR 1068.30 (excluding paragraph (2)(ii) of that definition), and is not used to propel a motor vehicle, aircraft, or a vehicle used solely for competition. Stationary ICE include reciprocating ICE, rotary ICE, and other ICE, except combustion turbines.

C. Applicability:

This boilerplate applies to construction or any project (which includes any addition or replacement of an emissions unit, any modification to an emissions unit or any combination of these changes) of an emergency or non-emergency diesel engine-generator set. This procedure document may be used as a guideline for other fuels; however, additional conditions (including different controls) may be required.

****Note:** Emergency diesel engine-generator set(s) may be exempt based on size alone per 9VAC5-80-1105 B.2.b (aggregate brake horsepower of less than 1,675 horsepower (1,125 kilowatts)). If not exempt by size, then the uncontrolled emissions need to be calculated and compared to the exemption thresholds in 9VAC5-80-1105 C or D.

1. Existing Source Rule 4-8, Emission Standards for Fuel Burning Equipment
   Diesel engine-generator sets are not subject to this existing source rule since they are exempt by 9VAC5-40-880 E, which states, "The provisions of this article do not apply to stationary internal combustion engines."

2. State Toxics (Rule 6-5)
   Since all diesel engine-generator sets are covered by (or specifically exempted from) NESHAP Subpart ZZZZ, Rule 6-5 is not considered for permit applicability, and Rule 6-5 also does not apply to any diesel engine (9VAC5-60-300 C.7).

3. NESHAP, Subpart ZZZZ - National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE)
   All diesel engine-generator sets (except engines being tested at a stationary RICE test cell/stand or as indicated at 40 CFR 63.6585(f)) are subject to this Subpart. A source is subject to this subpart "if you own or operate a stationary RICE at a major or area source of HAP emissions." This subpart includes sections for existing, new, and reconstructed engines. Certain engines may not have to meet limits, testing, etc. but they are still subject to the rule. However, the NESHAP exemption at 40 CFR 63.6585(f) (emergency engines at area sources of HAP located at residential, commercial or institutional facilities) is particularly relevant for data centers since EPA considers data centers to be commercial facilities, and most data centers are area sources of HAP.

   ****Note:** Currently, Virginia does not have delegation of NESHAP Subpart ZZZZ except for major sources as defined in 9VAC5-80-60 and affected sources as defined in 9VAC5-80-370. The permit writer should follow guidance document APG-569: Guidance to Implement and Enforce Non-delegated Federal Regulations.

4. NSPS, Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

For owners and operators of a diesel engine-generator set, the following units are subject to this Subpart:

New	Modified or Reconstructed
If the facility orders the engine after July 11, 2005 and it is manufactured after April 1, 2006.	Modify or reconstruct after July 11, 2005.

****Note:** Currently, Virginia does not have delegation of NSPS Subpart IIII except for major sources as defined in 9VAC5-80-60 and affected sources as defined in 9VAC5-80-370. The permit writer should follow guidance document APG-569: Guidance to Implement and Enforce Non-delegated Federal Regulations.

5. NSPS, Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines
   Diesel engine-generator sets are not subject to this Subpart since they are compression ignition internal combustion engines; not spark ignition internal combustion engines.

D. Emission Controls and BACT under Article 6:

Listed below are the conditions/emission limits that are considered presumptive BACT for emergency and/or non-emergency diesel engine-generator sets.

1. Particulate emissions

   a. Emergency and non-emergency engines (located at data centers):

      Particulate emissions shall be controlled by a diesel particulate filter (DPF), or equivalent (as required to meet the applicable Tier 4 standard), with a backpressure monitor that notifies the permittee when the high backpressure limit of the engine is approached.

      For engines with a displacement ≥ 30 liters per cylinder, a limit of 0.15 g/KW-hr (0.11 g/HP-hr) must be met **OR** the diesel particulate filter shall maintain and demonstrate a control efficiency for PM of no less than 60 percent (NSPS Subpart IIII §60.4204(c) and §60.4205(d)) (see optional sentence in Condition 2 of the boilerplate). Receiving an application for an engine with a displacement ≥ 30 liters per cylinder is atypical.

      With the 2025 revisions to this document, presumptive BACT for non-emergency gen-sets is now equivalent to the presumptive BACT for emergency gen-sets for units within the data center source category. Because of this, DEQ anticipates that future data center permit applications will request that most of their backup gen-sets be permitted as non-emergency units under Virginia regulations. The basis for the data center-specific presumptive BACT is as described in Section D.3.a.

      DEQ's experience with the data center source category does support limiting the application of DPF-level control to gen-sets that do not serve as secondary or tertiary backup power sources (i.e., backup other emergency gen-sets) or do not provide power to non-server resources at the site. Therefore, presumptive BACT for gen-sets serving these roles should remain equivalent to that specified for emergency gen-sets for non-data center source categories.

In general, because of additional costs and complexities associated with retrofits, projects that include modified gen-sets that were previously permitted as emergency units and that will remain permitted as emergency units continue to have a presumptive BACT equivalent to that specified for emergency gen-sets for non-data center source categories. However, any new or replacement gen-sets included in a project would be subject to the DPF (or equivalent) presumptive BACT described in this section.

As defined in 9VAC5 Chapter 50, a BACT limitation is always a case-by-case determination, and the BACT standards recommended in this document are only considered presumptive; i.e. if an applicant proposes BACT that is consistent with this document, DEQ will generally process that application with very minimal additional analysis of BACT. An applicant can always propose BACT that is less stringent than the presumptive BACT specified in this document. However, such an application would need to include a full, top-down BACT evaluation to support any less stringent BACT. The evaluation would need to demonstrate that the site-specific factors are so significantly different from the rest of the data center industry that the cost of DPF (or equivalent) control for the gen-sets covered by the application is substantially greater than the cost of DPF (or equivalent) control for gen-sets included in the data center source category as a whole. A showing that simply indicates a "high" cost or average cost-effectiveness for DPF systems should not be expected to succeed.

b. Emergency engines (source categories other than data centers):

Particulate emissions shall be controlled by the use of good operating practices and performing appropriate maintenance in accordance with the manufacturer recommendations.

c. For non-emergency engines (source categories other than data centers):

Particulate emissions shall be controlled by a diesel particulate filter (DPF) with a backpressure monitor that notifies the permittee when the high backpressure limit of the engine is approached. A DPF may be required for this type of engine in order to meet Tier 4 standards.

For engines with a displacement ≥ 30 liters per cylinder, a limit of 0.15 g/KW-hr (0.11 g/HP-hr) must be met **OR** the diesel particulate filter shall maintain and demonstrate a control efficiency for PM of no less than 60 percent (NSPS Subpart IIII §60.4204(c) and §60.4205(d)) (see optional sentence in Condition 2 of the boilerplate). Receiving an application for an engine with a displacement ≥ 30 liters per cylinder is atypical.

If a DPF is too cost prohibitive or is not needed to meet the applicable Tier standard, then PM emissions shall be controlled by the use of good operating practices and performing appropriate maintenance in accordance with the manufacturer recommendations.

2. Carbon monoxide emissions

a. Emergency and non-emergency engines (located at data centers):

Carbon monoxide (CO) emissions shall be controlled by a diesel oxidation catalyst (DOC), or equivalent (as required to meet the applicable Tier 4 standard).

With the 2025 revisions to this document, presumptive BACT for non-emergency gen-sets is now equivalent to the presumptive BACT for emergency gen-sets for units within the data center source category. Because of this, DEQ anticipates that future data center permit applications will request that most of their backup gen-sets be permitted as non-emergency units under Virginia regulations. The basis for the data center-specific presumptive BACT is as described in Section D.3.a.

DEQ's experience with the data center source category does support limiting the application of oxidation catalyst-level control to gen-sets that do not serve as secondary or tertiary backup power sources (i.e., backup other emergency gen-sets) or do not provide power to non-server resources at the site. Therefore, presumptive BACT for gen-sets serving these roles should remain equivalent to that specified for emergency gen-sets for non-data center source categories.

In general, because of additional costs and complexities associated with retrofits, projects that include modified gen-sets that were previously permitted as emergency units and that will remain permitted as emergency units continue to have a presumptive BACT equivalent to that specified for emergency gen-sets for non-data center source categories. However, any new or replacement gen-sets included in a project would be subject to the DOC (or equivalent) presumptive BACT described in this section.

As defined in 9VAC5 Chapter 50, a BACT limitation is always a case-by-case determination, and the BACT standards recommended in this document are only considered presumptive; i.e. if an applicant proposes BACT that is consistent with this document, DEQ will generally process that application with very minimal additional analysis of BACT. An applicant can always propose BACT that is less stringent than the presumptive BACT specified in this document. However, such an application would need to include a full, top-down BACT evaluation to support any less stringent BACT. The evaluation would need to demonstrate that the site-specific factors are so significantly different from the rest of the data center industry that the cost of DOC (or equivalent) control for the gen-sets covered by the application is substantially greater than the cost of DOC (or equivalent) control for gen-sets included in the data center source category as a whole. A showing that simply indicates a "high" cost or average cost-effectiveness for DOC systems should not be expected to succeed.

b. Emergency engines (source categories other than data centers):

Carbon Monoxide (CO) emissions shall be controlled by the use of good operating practices and performing
appropriate maintenance in accordance with the manufacturer recommendations.

c. Non-emergency engines (source categories other than data centers):

Carbon monoxide (CO) emissions shall be controlled by a diesel oxidation catalyst (DOC). A DOC may be required for this type of engine in order to meet Tier 4 standards.

If a DOC is too cost prohibitive or is not needed to meet the applicable Tier standard, then CO emissions shall be controlled by the use of good operating practices and performing appropriate maintenance in accordance with the manufacturer recommendations.

3. Nitrogen oxide emissions

   a. Emergency and non-emergency engines (located at data centers): Emission limit = 0.60 g/hp-hr

      This BACT limit is reflective of SCR control or equivalent.

      With the 2025 revisions to this document, presumptive BACT for non-emergency gen-sets is now equivalent to the presumptive BACT for emergency gen-sets for units within the data center source category. Because of this, DEQ anticipates that future data center permit applications will request that most of their backup gen-sets be permitted as non-emergency units under Virginia regulations.

      BACT provides for a determination that considers the control efficiencies achieved in the industry for the source type. Due to a number of specific characteristics, such as aggregate engine capacity, emissions and operational profiles, and economic costs borne in practice, the data center source category warrants several special considerations in a BACT determination for engine-generator sets.

      First, and most importantly, DEQ has permitted numerous data centers that operate with SCR-level control (either Tier II gen-sets with add-on SCRs, Tier 4-certified gen-sets, or Tier 4-equivalent gen-sets) on engines that essentially operate as emergency gen-sets. Where some applications may have labelled such gen-sets as non-emergency, the proposed annual operation profile for the subject gen-sets matches the historic (i.e., very limited) operation profile of an emergency gen-set. Except for the very small percentage of Tier 4-certified gen-sets, the units continue to be classified as emergency under the EPA engine rules.

      DEQ has also considered the permit history and operating profile for data center gen-sets that now strongly indicate that gen-sets permitted as emergency units will be operated for extended periods under certain circumstances.

      DEQ's experience with the data center source category does support limiting the application of SCR-level control to gen-sets that do not serve as secondary or tertiary backup power sources (i.e., backup other emergency gen-sets) or do not provide power to non-server resources at the site. Therefore, presumptive BACT for gen-sets serving these roles should remain equivalent to that specified for emergency gen-sets for non-data center source categories.

      In general, because of additional costs and complexities associated with retrofits, projects that include modified gen-sets that were previously permitted as emergency units (without SCR) and that will remain permitted as emergency units continue to have a presumptive BACT equivalent to that specified for emergency gen-sets for non-data center source categories. However, any new or replacement gen-sets included in a project would be subject to the SCR-based presumptive BACT described in this section.

In summary, the available information now indicates that SCR-equipped gen-sets are widely available, the source category (i.e., data centers) is achieving these control efficiencies in practice, and the source category is bearing the higher cost (relative to non-SCR gen-sets) associated with such SCR systems. For data centers, the traditional "limited operating hours" basis for determining that SCR systems should not be considered BACT for emergency gen-sets is no longer appropriate.

NO_X emissions shall be controlled by an open or closed loop SCR system or equivalent, meeting the following requirements:

(a) Except as indicated below, each SCR system shall be equipped with a temperature probe to continuously monitor the catalyst bed exhaust temperature.

(b) Engine exhaust gas shall be treated with urea or an ammonia solution when the engine(s) are operating at or above 20% load and the catalyst bed exhaust temperature of 570°F is achieved, except for periods of start-up or shutdown. The temperature is the preferred metric, but minimum load is available if for some reason (e.g., certain Tier 4-certified units), the catalyst bed temperature is unavailable. Note that both the minimum temperature and load values are general estimates that should be revised if data specific to the SCR and/or gen-manufacturer, which may be higher or lower, is available.

(c) The permittee shall operate the gen-sets and SCR systems such that the catalyst bed exhaust temperature does not exceed 930°. 930°F is a general value that may be used in the absence of more specific data from the SCR and/or gen-set manufacturer.

For engines with a displacement ≥ 30 liters per cylinder, a limit of 1.6 g/KW-hr (1.2 g/HP-hr) must be met **OR** the SCR shall maintain and demonstrate a control efficiency for NO_X of no less than 90 percent (NSPS Subpart IIII §60.4204(c) and §60.4205(d)). Receiving an application for an engine with a displacement ≥ 30 liters per cylinder is atypical.

As defined in 9VAC5 Chapter 50, a BACT limitation is always a case-by-case determination, and the BACT standards recommended in this document are only considered presumptive; i.e. if an applicant proposes BACT that is consistent with this document, DEQ will generally process that application with very minimal additional analysis of BACT. An applicant can always propose BACT that is less stringent than the presumptive BACT specified in this document. However, such an application would need to include a full, top-down BACT evaluation to support any less stringent BACT. The evaluation would need to demonstrate that the site-specific factors are so significantly different from the rest of the data center industry that the cost of SCR control for the gen-sets covered by the application is substantially greater than the cost of SCR control for gen-sets included in the data center source category as a whole. A showing that simply indicates a "high" cost or average cost-effectiveness for SCR systems should not be expected to succeed.

b. Emergency engines (source categories other than data centers): Emission limit = 6.0 g/hp-hr

This BACT limit has been derived and achieved over an extended period of time through actual stack test data from numerous units and various manufacturers.

NO_X emissions shall be controlled by electronic fuel injection **and/or** turbocharged engine **and/or** aftercooler **and/or** charge air cooler **and/or** low NO_X emission package. The option(s) that should be chosen are the ones listed on the manufacturer specification sheet, i.e. the design of the engine. These control devices are integral parts of an engine and cannot be made available for inspection. Therefore, the permittee shall maintain documentation that demonstrates the control device has been installed on the engine-generator set(s).

> ****Note:** A SCR is not required for emergency engines as it is for non-emergency engines, but the facility may need to install the control device to meet the BACT emission limit. If so, the SCR system will need to follow the specifications below.

c. Non-emergency engines (source categories other than data centers): Emission limit = 0.60 g/hp-hr

This BACT limit has been derived and achieved with NO_X control technology (currently SCR) achieving a 90% reduction.

NO_X emissions shall be controlled by an open or closed loop SCR system or equivalent, meeting the following requirements:

(a) Each SCR system shall be equipped with a temperature probe to continuously monitor the catalyst bed exhaust temperature.

(b) Engine exhaust gas shall be treated with urea or an ammonia solution when the engine(s) are operating at or above 20% load and the catalyst bed exhaust temperature of 570°F is achieved, except for periods of start-up or shutdown. The temperature is the preferred metric, but minimum load is available if for some reason (e.g., certain Tier 4-certified units), the catalyst bed temperature is unavailable. Note that both the minimum temperature and load values are general estimates that should be revised if data specific to the SCR and/or gen-manufacturer, which may be higher or lower, is available.

(c) The permittee shall operate the gen-sets and SCR systems such that the catalyst bed exhaust temperature does not exceed 930°. 930°F is a general value that may be used in the absence of more specific data from the SCR and/or gen-set manufacturer.

For engines with a displacement ≥ 30 liters per cylinder, a limit of 1.6 g/KW-hr (1.2 g/HP-hr) must be met **OR** the SCR shall maintain and demonstrate a control efficiency for NO_X of no less than 90 percent (NSPS Subpart IIII §60.4204(c) and §60.4205(d)). Receiving an application for an engine with a displacement ≥ 30 liters per cylinder is atypical.

If a NO_X control technology is too cost prohibitive or is not needed to meet the applicable Tier standard, then NO_X emissions shall be controlled by the use of good operating practices and performing appropriate maintenance in accordance with the manufacturer recommendations.

4. Sulfur dioxide emissions

a. Emergency and non-emergency engines:

Sulfur Dioxide (SO_2) emissions shall be controlled by the use of low sulfur diesel fuel oil with a sulfur content not to exceed 0.0015% by weight (15ppm).

**Note: This was taken from NSPS Subpart IIII (per §60.4207(b)). Where Virginia does not have delegation of Subpart IIII, the NSPS is not referenced in the permit but the requirement to have a sulfur content of 0.0015% is included.

5. Volatile Organic Compounds (VOC)

   a. Emergency and non-emergency engines:

      VOC emissions shall be controlled by the use of good operating practices and performing appropriate maintenance in accordance with the manufacturer's recommendations.

6. Visible Emissions (Opacity)

   a. Emergency and non-emergency engines:

      Visible emissions shall be controlled by the use of good operating practices and performing appropriate maintenance in accordance with the manufacturer's recommendations.

      (a)For emergency engines in an attainment area:
      - Visible emissions shall not exceed 10% opacity except during one 6-minute period in any one hour in which visible emissions shall not exceed 20% opacity as determined by EPA Method 9 (reference 40 CFR 60, Appendix A). This condition applies at all times except during startup and shutdown.

      (b)For emergency engines in a nonattainment area:
      - Visible emissions shall not exceed 5% opacity except during one 6-minute period in any one hour in which visible emissions shall not exceed 10% opacity as determined by EPA Method 9 (reference 40 CFR 60, Appendix A). This condition applies at all times except during startup and shutdown.

      (c)For non-emergency and emergency engines with SCR:
      - Visible emissions shall not exceed 5% opacity as determined by EPA Method 9 (reference 40 CFR 60, Appendix A). This condition applies at all times except during startup and shutdown.

      (d)For all engines:
      - Visible emissions during startup and shutdown shall not exceed 10% opacity except during one (1) six-minute period in any one-hour in which visible emissions shall not exceed 20% opacity as determined by EPA Method 9 (reference 40 CFR 60, Appendix A).

E. Monitoring:

Each engine-generator set shall be equipped with either a (1) non-resettable hour metering device to continuously monitor the operating hours AND/OR (2) fuel flow meter to continuously monitor the fuel throughput. The meter for each engine-generator set shall be observed by the owner with a

frequency of not less than once each day the engine-generator set is operated. The owner shall keep a log of these observations.

For parallel setups and engines with SCR, each engine-generator set shall also be equipped with a device to monitor and record the engine-generator kilowatt output at a minimum frequency of once every fifteen minutes.

- For parallel setups: Since the engine-generator sets are all linked into one central electrical line and share load, kilowatt output (i.e. load) needs to be monitored.
- For engines with SCR: the boilerplate requires that the engine exhaust gas be treated with urea or an ammonia solution when the catalyst bed exhaust temperature and 20% load is reached. The KW monitor is used so that facility is able to demonstrate compliance with this condition.

For engine-generator set(s) with a SCR, the following needs to be monitored:

- The SCR catalyst bed exhaust temperature, and
- For open loop - the urea/ammonia injection rate, **OR**
- For closed loop - the NO_x emissions measured after the catalyst, expressed in ppm.

The information for the SCR shall each be recorded at a minimum frequency of once every fifteen minutes, and correlated to the run date, engine load/kilowatt output, and engine operating hours. Fifteen minutes was chosen as a minimum frequency for averaging purposes.

For engine-generator set(s) with a DOC, the DOC catalyst bed temperature needs to be monitored. The information for the DOC shall each be recorded at a minimum frequency of once every fifteen minutes, and correlated to the run date, engine load/kilowatt output, and engine operating hours. Fifteen minutes was chosen as a minimum frequency for averaging purposes

For engine-generator set(s) with a DPF, the differential pressure drop across the filter needs to be monitored. The filter shall be observed by the permittee with a frequency as recommended by the process/control equipment manufacturer.

F. Emission Limits/Calculations:

Permit applicability and emission limit calculations for each diesel engine-generator set should be based on the manufacturer specification sheets. Manufacturer specification sheets are information provided by the manufacturer to the facility that shows the air emissions (usually NO_x, CO, PM, and VOC or HC) for that particular engine-generator set. They should be provided by the facility when submitting an application for a diesel engine-generator set. This is the best information that we can get since it is specific to the type and size of the engine-generator set. If manufacturer specification sheets are not provided by the facility, the permit writer should ask for them during the 30 day review period.

NSPS standards should not be used or compared to the manufacturer specifications since they are weighted averages. The NSPS standards specified in Table 1 (40 CFR 89.112) are measured using the procedures in Subpart E of 40 CFR Part 89. Looking closely into Subpart E (89.404), the test cycles consist of various steady state operating modes that include different combinations of engine speeds and loads, i.e. on a weighted cycle. Technical data that is supplied by the manufacturer is based on 100% load, not on a weighted cycle. Therefore, the NSPS standards do not equate to the manufacturer standards at a given load and cannot be compared together.

In the same manner, AP-42 emission factors should not be used for calculation purposes since the manufacturer specifications are the best emission factors for that specific engine. IF for some reason, on a case-by-case basis, the facility cannot or does not have the manufacturer specification sheets AND there are no other possible emission factors, the AP-42 emission factors may be used. The permit writer should explain the reasoning in the engineering analysis. This should be an infrequent occurrence.

1. Uncontrolled Emissions for Permit Applicability

   Uncontrolled emissions for permit applicability should be calculated using the manufacturer Not To Exceed (NTE) (or equivalent) emission factors at the worst case load for that specific engine and pollutant. Load is pollutant specific. For example, NO_X will have the worst case emission factor at 100% load while PM may have a worse case emission factor at 25% load.

2. Emission Limit (lb/hr)

   The engine-generator set lbs/hr emission limit that is placed into the permit for the facility to demonstrate compliance with is the manufacturer NTE standard converted to lbs/hr. An example conversion is below:

   Engine size = 500 hp
   Emission standard = 2.5 gram (g) CO/horsepower (hp)-hour

$$\left(\frac{2.5\ g\ CO}{hp-hr}\right) * \left(\frac{1\ lb}{453.6\ g}\right) * (500\ hp) = \frac{2.8\ lbs\ CO}{hr}$$

   If the manufacturer NTE standard is not supplied, the manufacturer nominal standard plus an additional 25% can be used. For example, if the manufacturer nominal standard is 4.0 lbs/hr, the emission limit in the permit would be 4.0 lbs/hr x 1.25 = 5.0 lbs/hr.

3. Emission Limit (tons/yr)

   To calculate the annual emission limit in tons/yr for a specific engine-generator set, the manufacturer NTE standard (or the manufacturer nominal standard + 25%) should be multiplied with the engine throughput limit. An example calculation is below:

   Engine size = 500 hp
   Emission standard = 2.5 g CO/hp-hr
   Throughput limit = 1000 hrs/yr

$$\left(\frac{2.5\ g\ CO}{hp-hr}\right) * \left(\frac{1\ lb}{453.6\ g}\right) * (500\ hp) = \frac{2.8\ lbs\ CO}{hr}$$

$$\left(\frac{2.8\ lbs\ CO}{hr}\right) * \left(\frac{1000\ hrs}{yr}\right) * \left(\frac{ton\ CO}{2000\ lbs\ CO}\right) = \frac{1.4\ tons\ CO}{yr}$$

G. Recordkeeping:

On site records should contain:

a. [O] Annual hours of operation of each engine-generator set, 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.
b. [O] Annual consumption of diesel fuel, 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.
   **Note: Items a and b are optional depending on what kind of throughput condition the facility requested.
c. All fuel supplier certifications.
d. Engine information including make, model, serial number, model year, maximum engine power (bhp), and engine displacement for each engine-generator set.
e. The manufacturer's written operating instructions or procedures developed by the owner/operator that are approved by the engine manufacturer for each engine-generator set.
f. Records of the reasons for operation for each engine-generator set (Ref. Nos. {#s}), including, but not limited to, the date, cause of operation, [cause of the emergency,] [the ISO-declared emergency notification,] [and the hours of operation.]
g. [O] [*For engines with SCR*] A NO_x [Urea] [Ammonia Solution] Table ([Urea] [Ammonia Solution] Load Map) for each engine-generator set, (Ref #), equipped with SCR to verify that the SCR is operating as specified by the manufacturer. Each NO_x [Urea] [Ammonia Solution] Table shall include the engine load, temperature after the catalyst, NO_x concentration before and after the catalyst, the [urea] [ammonia solution] consumption rate, and the catalyst efficiency.
h. [O] [*For engines with SCR*] Operation and control device monitoring records for each engine-generator set equipped with a SCR (Ref. Nos. {#s}) as required in Condition {condition number}. This includes records of the SCR catalyst exhaust bed temperature and [[*For open loop SCR*] [Urea] [Ammonia solution] injection rate] [[*For closed loop SCR*] NO_x emission concentration as measured by SCR continuous monitoring device].
i. [O] [*For engines with DOC*] Operation and control device monitoring records for each engine-generator set equipped with a DOC (Ref. Nos. {#s}) as required in Condition {condition number}. This includes records of the DOC catalyst bed temperature.
j. [O] [*For engines with DPF*] Operation and control device monitoring records for each engine-generator set equipped with a DPF (Ref. Nos. {#s}) as required in Condition {condition number}. This includes records of the differential pressure drop across the filter.
k. [O] [*For parallel setups and engines with SCR*] Operation and control device monitoring records for each engine-generator set (Ref. Nos. {#s}) as required in Condition {condition number}.
l. [O] [*Particulate filter - If control efficiency option is used*] Control efficiency of the diesel particulate filter using a calculation method approved by the «Region».
m. [O] [*SCR - If control efficiency option is used*] Control efficiency of the SCR using a calculation method approved by the «Region».
n. Results of all stack tests and visible emission evaluations.
o. Scheduled and unscheduled maintenance and operator training.
p. [O] {other records as required}.

These records shall be available for inspection by the DEQ and shall be current for the most recent five years.

H. Initial Notifications:

These initial notifications shall be included in the permit:

a. The actual date on which {construction **or** modification **or** replacement **or** relocation} of the engine-generator set[s] (Ref. Nos. {#s}) commenced within 30 days after such date.
b. The anticipated start-up date of the engine-generator set[s] (Ref. Nos. {#s}) postmarked not more than 60 days nor less than 30 days prior to such date.
c. The actual start-up date of the engine-generator set[s] (Ref. Nos. {#s}) 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 and visible emissions evaluation of the engine-generator set[s] (Ref. Nos. {#s}) postmarked at least 30 days prior to such date.

I. Testing Requirements (data centers)**:**

Initial VEE: This boilerplate does contain a requirement for an initial visible emissions evaluation for emergency (and non-emergency) gen-sets located at data center stationary sources. An initial visible emissions evaluation shall be conducted to show that the unit is in compliance with the appropriate opacity standard. Each test shall consist of 30 sets of 24 consecutive observations (at 15 second intervals) to yield a six minute average. Testing shall be conducted with the engine(s) operating at greater than 90% capacity, unless multiple load band testing is approved by DEQ.

Initial Stack Testing: This boilerplate does contain a requirement for stack testing for emergency (and non-emergency) gen-sets located at data center stationary sources. Initial performance tests shall be conducted for CO and NO_X to determine compliance with the emission limits listed in the permit. Emissions testing of each pollutant for each selected engine-generator set shall consist of three one-hour test runs under load. The average of the three runs shall be reported as the short-term emission rate for that engine-generator set. Testing shall be conducted with the engine(s) operating at greater than 90% capacity, unless multiple load band testing is approved by DEQ.

Initial VEE and Stack Testing: The initial compliance determination testing described above will typically be applied to 20-25% of the units for each type of gen-set permitted at a data center.

J. Testing Requirements (non-data center source categories)**:**

Initial VEE: This boilerplate does contain a requirement for an initial visible emissions evaluation for non-emergency engine-generator sets. An initial visible emissions evaluation shall be conducted to show that the unit is in compliance with the appropriate opacity standard. Each test shall consist of 30 sets of 24 consecutive observations (at 15 second intervals) to yield a six minute average. Testing shall be conducted with the engine(s) operating at greater than 90% capacity, unless multiple load band testing is approved by DEQ.

Initial Stack Testing: This boilerplate does contain a requirement for stack testing for non-emergency engine-generator sets. Initial performance tests shall be conducted for NO_X to determine

compliance with the emission limits and, if necessary, control efficiency requirements, listed in the permit. CO is an optional pollutant to be tested based on if BACT is required on a case-by-case basis. Emissions testing of each pollutant for each selected engine-generator set shall consist of three one-hour test runs under load. The average of the three runs shall be reported as the short-term emission rate for that engine-generator set. Testing shall be conducted with the engine(s) operating at greater than 90% capacity, unless multiple load band testing is approved by DEQ.

Initial VEE and Stack Testing: If multiple gen-sets of the same type are installed, DEQ will determine the number of gen-sets to be tested on a case-by-case basis.

Although emergency gen-sets located at non-data center stationary sources are not typically required to conduct initial compliance demonstrations, DEQ retains the discretion to require such demonstrations, particularly for facilities with large numbers of gen-sets, poorly documented/otherwise uncertain emission factors, and/or permitted emission limits close to major source thresholds.