Emergency generators and pumps

In recent years, emergency engines, that is, reciprocating internal combustion engines (RICE) used to power emergency generators and pumps, have become more of a concern to DEQ for the following reasons:

* EPA’s promulgation of two New Source Performance Standards (NSPSs), 40 CFR Part 60, Subparts IIII and JJJJ, and a National Emission Standard for Hazardous Air Pollutants (NESHAP), 40 CFR Part 63, Subpart ZZZZ, for reciprocating internal combustion engines;
* the construction of data centers equipped with a large backup generator capacity powered by emergency engines; and
* the realization that at least one existing source is also equipped a large backup generator capacity powered by emergency engines.

As part of this rulemaking, DEQ proposed two changes that pertain to emergency engines: one proposed change concerns the definition of “categorically insignficant activities” in division 200; the other change concerns a proposed new permitting category in division 216 for emergency generators.

Categorically insignificant emergency generators and pumps

Since the beginning of DEQ’s Title V permitting program in the 1990s, emergency generators and pumps have been classified as “categorically insignificant activities” and have generally not been addressed in permits. DEQ has not defined an emission level that applies to categorically insignificant activities, but OAR 340-200-0020 includes a definition of “de minimis emission level”. Emergency engines are usually diesel engines, and NOx is the pollutant emitted at the highest rate from diesel engines, assuming the use of ultra-low sulfur diesel fuel. The de minimis emission level for NOx is 1 ton per year. DEQ believes there are sources that have enough emergency engine capacity to emit more than 1 ton per year from maintenance and readiness testing operation of their emergency engines. Therefore, DEQ believes it is appropriate to revise the category of emergency generators and fire pumps in the definition of categorically insignificant activities to exclude emergency engines if they exceed a specified threshold, which is discussed below.

DEQ proposed to change this category to read as follows:

Stationary emergency generators and pumps used only during loss of primary equipment or utility service due to circumstances beyond the reasonable control of the owner or operator, or to address a power emergency; unless one or both of the following conditions is met, then all of this equipment is no longer categorically insignificant:

(A) The aggregate emissions from stationary emergency generators and pumps are greater than the de minimis level for any regulated pollutant based on the readiness and testing hours of operation allowed by NSPS or NESHAP requirements or some other hours of operation specified in a permit; or

(B) Any individual stationary emergency generator or pump is rated at 500 horsepower or more.

In (A), the readiness and testing hours of operation allowed by NSPS or NESHAP requirements is 100 hours per year. Commenters pointed out that sources have no incentive to actually operate emergency engines for this number of hours, and DEQ agrees. The proposed language would allow a source to specify a different number of hours per year in a permit, but this would obviously require revising a permit to specify the number of hours. Upon reconsideration, DEQ believes that the proposed change would create an additional workload for affected sources as well as for DEQ with little or no environmental benefit.

DEQ believes it is possible to establish a conservative default aggregate engine horsepower level at which emissions can reliably be assumed to not exceed the deminimis level. DEQ believes that this default level will allow emergency generators and pumps at the majority of sources to still be considered categorically insignificant without requiring emissions calculations or permit revisions to specify the number of operating hours used for the emissions calculations.

DEQ conservatively estimated the default maximum aggregate horsepower as explained below.

* DEQ used the uncontrolled diesel engine NOx emission factor of 0.024 lb/hp-hr from AP-42, Table 3.4-1, and
* DEQ used 28 hours per year of operation for testing and maintenance, determined as follows:
  + One source[[1]](#footnote-1) indicates that emergency generators should be tested for 30 minutes per month. Another source[[2]](#footnote-2) indicated that the 30 minutes does not include warm-up and cool-down time; DEQ has therefore assumed a minimum of 1 hour of operation per month. In addition, this source indicates that certain emergency generators, such as those at hospitals, must perform an annual load test that lasts for a minimum of 2 hours (DEQ assumes this also does not include warm-up and cool-down and therefore assumes a total of 3 hours of operation). Assuming 1 hour of operation for 11 months plus 3 hours in one month gives a total minimum operating time of 14 hours per year. To be conservative, DEQ has doubled this value to 28 hours per year.

Based on the above, the default maximum horsepower rating is:

1 ton/yr x 2000 lb/ton / (0.024 lb/hp-hr x 28 hr/yr) = 2,976 hp (rounded to 3,000 hp).

The final proposed revision for category (uu) reads as follows:

(uu) Stationary emergency generators and pumps used only during loss of primary equipment or utility service due to circumstances beyond the reasonable control of the owner or operator, or to address a power emergency, provided that the aggregate horsepower rating of all stationary emergency generators and pumps is not more than 3,000 horsepower. If the aggregate horsepower rating of all stationary emergency generators and pumps is more than 3,000 horsepower, then no emergency generators and pumps at the source may be considered categorically insignificant;

Proposed new permitting category in division 216 for emergency generators

DEQ has recently required data centers to obtain permits. These data centers are equipped with a large backup generator capacity powered by emergency engines. DEQ based this requirement on the current permit category 85 in division 216, Table 1, Part B, which reads:

All Other Sources not listed herein that would have actual emissions, if the source were to operate uncontrolled, of 5 or more tons a year of PM10 if located in a PM10 non-attainment or maintenance area, or 10 or more tons of any single criteria pollutant in any part of the state. DEQ required these facilities to estimate their emissions based on the 100 hours of readiness and testing operation allowed by the NSPS and NESHAP requirements.

DEQ was also motivated by the fact that the engines at these facilities were subject to the RICE NSPS and NESHAP requirements, and reasoned that such significant groupings of emergency engines should have permits and be subject to DEQ inspection to insure compliance with the NSPS and NESHAP requirements.

Upon reconsideration of this proposed permitting category, DEQ took into consideration the comment that owners and operators of emergency engines have no reason to operate the engines for the full 100 hours per year specified in the NSPSs and NESHAP. However, DEQ also took into consideration that the real environmental concern over data centers and other sources with large backup generating capacity is their short term emissions. During an actual power outage, many or all of the emergency engines at these sources will be operated, resulting in short term emissions equivalent to the short term emissions of much larger sources. Although DEQ does not regulate the emergency operation of these engines, one of DEQ’s goals is to ensure that emissions are minimized during emergency operation by proper maintenance of the engines.

As discussed above in the section on categorically insignificant activities, DEQ believes it is possible to establish a simple aggregate horsepoer threshold level for this permitting category, rather than requiring all potentially affected sources to calculate their emissions or obtain a permit for the purpose of being able to specify some number of readiness and testing hours other than 100 hour per year.

The approach used to calculate a threshold horsepower level for permitting is similar to the approach used to calculate a threshold horesepower level for categorically insignificant activities.

DEQ conservatively estimated the default maximum aggregate horsepower as explained below.

* DEQ used the uncontrolled diesel engine NOx emission factor of 0.024 lb/hp-hr from AP-42, Table 3.4-1, and
* DEQ used 28 hours per year of operation for testing and maintenance, determined as described in the preceding section on categorically insignificant activities.

Based on the above, the permitting threshold based on the aggregate horsepower rating of the source is:

10 ton/yr x 2000 lb/ton / (0.024 lb/hp-hr x 28 hr/yr) = 29,762 hp (rounded to 30,000).

DEQ notes that several data centers have already been issued permits. The data center with the least emergency generating capacity has an aggregate rating of 22,500 kilowatts. Assuming 85 percent efficiency converting engine power to electricity, this is equivalent to approximately 35,500[[3]](#footnote-3) horsepower. Therefore the data centers already permitted will be required to have a permit under the proposed permitting threshold as well.

The final proposed revision to division 216, Table 1, Part B, category 87(a) is:

87 Stationary internal combustion engines only if the aggregate horsepower rating of all emergency generators and firewater pumps is 30,000 horsepower or more; or

(b) For any individual non-emergency or non-fire pump engine, the engine is subject to 40 CFR part 63, subpart ZZZZ and is rated at 500 horsepower or more, excluding two stroke lean burn engines, engines burning exclusively landfill or digester gas, and four stroke engines located in remote areas; or

(c) For any individual non-emergency engine, the engine is subject to 40 CFR part 60, subpart IIII and:

(A) The engine has a displacement of 30 liters or more per cylinder; or

(B) The engine has a displacement of less than 30 liters per cylinder and is rated at 500 horsepower or more; or

(d) For any individual non-emergency engine, the engine is subject to 40 CFR part 60, subpart JJJJ and is rated at 500 horsepower or more,

1. **Maintaining Emergency and Standby Engine-Generator Sets**

   Hartford Steam BoilerOne State Street P.O. Box 5024 Hartford, CT 06102-5024 Tel: (800) 472-1866 www.hsb.com June 2014

   Start and run the engine-generator monthly. Operate the engine until its temperature has been stable for at least 10 minutes. Operate the generator annually for a minimum of 1 hour at 100% of the generator nameplate capacity.

   **Power topic #7004 | Technical information from Cummins Power Generation**

   Maintenance is one key to diesel generator set reliability

   > White paper By Timothy A. Loehlein, Project Manager

   Exercise the generator set at least once a month for a minimum of 30 minutes loaded to no less than one-third of the nameplate rating. [↑](#footnote-ref-1)
2. **INSPECTION AND TESTING OF EMERGENCY GENERATORS**

   available at: http://www.health.state.mn.us/divs/fpc/Gensets2.pdf

   Monthly testing

   1. To meet federal certification and state licensure requirements, healthcare facilities must exercise their emergency generators under load at least monthly [see NFPA 110(99), Sec. 6-4.1; NFPA 110(02), Sec. 8.4.1]. There are a number of ways to comply with this requirement:

   a. The base requirement is that generators be exercised for a minimum of 30 minutes\* using one of the following methods [see NFPA 110(99), Sec. 6-4.2; NFPA 110(02), Sec. 8.4.2]:

   i. Under operating temperature conditions and at not less than 30 percent of the generator’s nameplate kW rating. A 100 kW generator, for example, would need to be exercised under a load of at least 30 kW to meet this requirement.

   • Normal operating temperatures are set by the manufacturer. Something to consider when scheduling your monthly tests is that your particular generator may not reach operating temperature in 30 minutes\* and that running the generator for short periods of time may be harmful to the engine. You also want to make sure that the generator runs long enough to ensure that all engine parts are properly lubricated.

   ii. Loading that maintains the minimum exhaust gas temperatures recommended by the manufacturer (it is unlikely that minimum exhaust gas temperatures will be reached if the generator isn’t carrying a load equivalent to at least 30 percent of the generator’s nameplate kW rating).

   \*Note: Warm-up and cool-down times do not count toward the required 30 minutes.

   b. An alternate method is provided for diesel-powered generators that do not meet the testing requirements outlined in 1.a above. This could occur when, for example, a large generator in relation to the load is installed (e.g. either to account for the largest motor connected to the generator or to accommodate future expansion of the facility). Such generators can be exercised monthly with the available load and exercised annually with supplemental loads at 25 percent of nameplate rating for 30 minutes, followed by 50 percent of nameplate rating for 30 minutes, followed by 75 percent of nameplate rating for 60 minutes, for a total of 2 continuous hours [see NFPA 110(99), Sec. 6-4.2.2; NFPA 110(02), Sec. 8.4.2.3]. [↑](#footnote-ref-2)
3. hp = 22,500 kW/(0.7457 x 0.85) = 35,498 hp [↑](#footnote-ref-3)