# Emergency Generators NSPS and MACT Regulations and the Certificate of Conformity

Richard M. Cestone, PE, CHMM
Senior Project Engineer

Remington & Vernick Engineers
For New Jersey Water Environment Association Conference

May 7, 2019

# USEPA Certificate of Conformity

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2014 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT OF 1990

OFFICE OF TRANSPORTATION
AND AIR QUALITY
ANN ARBOR, MICHIGAN 48105

**Certificate Issued To:** **Generac Power Systems, Inc.**
(U.S. Manufacturer or Importer)
**Certificate Number: EGNXB12.92C3-041**

**Effective Date:** 12/16/2013
**Expiration Date:** 12/31/2014

Byron J. Bunker, Division Director
Compliance Division

**Issue Date:** 12/16/2013
**Revision Date:** N/A

**Manufacturer:** Generac Power Systems, Inc.
**Engine Family:** EGNXB12.92C3
**Certificate Number:** EGNXB12.92C3-041
**Certification Type:** Stationary (Part 60)
**Fuel :** Natural Gas (CNG/LNG)
**Emission Standards :** CO ( g/kW-hr ) : 5.4
NOx ( g/kW-hr ) : 2.7
VOC ( g/kW-hr ) : 1.3
**Emergency Use Only :** Y

Pursuant to Section 213 of the Clean Air Act (42 U.S.C. section 7547) and 40 CFR Part 60, 1065, 1068, and 60 ( stationary only and combined stationary and mobile ) and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following nonroad engines, by engine family, more fully described in the documentation required by 40 CFR Part 60 and produced in the stated model year.

This certificate of conformity covers only those new nonroad spark-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Part 60 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Part 60. This certificate of conformity does not cover nonroad engines imported prior to the effective date of the certificate.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068.20 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Part 60. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR Part 60.

This certificate does not cover large nonroad engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.

## Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity

Emergency Generators for Publicly Owned Treatment Works (POTW):

- Backup Generator for wastewater treatment facilities
- Pump Stations
- Wells (if Utility Authority also is the water purveyor)

What is the most common type of Emergency Generator?

# Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity

## Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity

Reciprocating Internal Combustion Engine (RICE)

- The RICE Engine has cylinders which fuel and air combination react in each cylinder causing pushing each piston to move which generates energy (mechanical and electrical).

Mobile or stationary

- Mobile – Motor vehicles, portable generators
- Stationary – Emergency generators and other generators.

Why are Emergency Generators necessary to operate at wastewater treatment plants and pump stations?

## Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity

- Continuing operation of wastewater equipment during power outages.
- Pumps at pump stations and wastewater equipment at facilities are electrical dependent.
- The Emergency Generator provides electrical and mechanical energy to temporarily operate the equipment during the power outage.
- Emergency generator engines generate air contaminants and are regulated by the Clean Air Act and the Clean Air Act Amendments of 1990.

## Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity

Two different types of Reciprocating Internal Combustion Engines

- Compression Ignition – fuel injected into compressed air in cylinder and ignites causing the piston to move and generating energy.
- Spark Ignition – a spark ignites the fuel in the cylinder to cause the piston to move.

What additional equipment is needed for a spark ignition engine that a compression ignition engine does not need?

# Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity

## Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity

Spark Ignition Engines need spark plugs to produce the sparks in the pistons and the spark plug is connected to the battery.

Most common fuels for each type of engine:

- Compression Ignition – Diesel
- Spark Ignition – Natural Gas

Why does diesel powered engines not require spark plugs?

## Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity

Diesel has a relatively low auto ignition temperature (410˚F) and can ignite without the aid of a spark by injecting diesel into compressed air.

Natural gas has a much higher auto ignition temperature and will need a spark to ignite the gas mixture in the piston.

Lean Burn versus Rich Burn

- Lean burn is increased excess air limiting fuel but above Lower Explosive Limit
- Rich burn is at stoicheometric air

## Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity

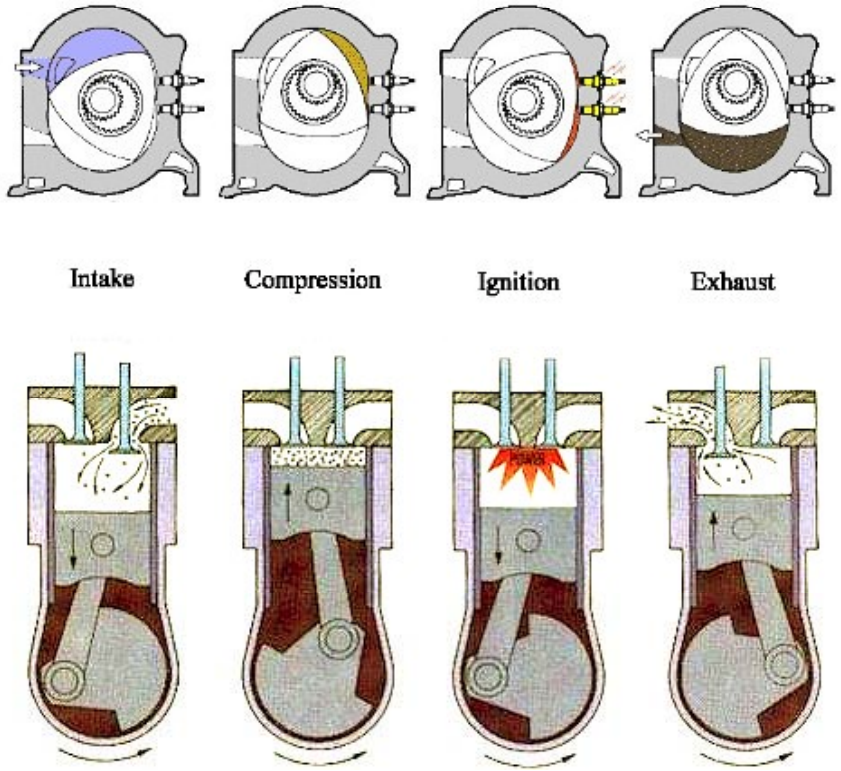
Two Stroke and Four Stroke Engines

- A Stroke is where the piston moves from one position to another where one cycle is two strokes.

- Four Stroke Engines
  1. Fuel/Air mixture enters chamber
  2. Fuel/Air mixture is compressed
  3. Reaction of fuel air mixture expands
  4. Exhaust gases are pushed out

- Two Stroke Engines – fuel mixture replaces exhaust gas in expanded stroke at the same time

## Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity



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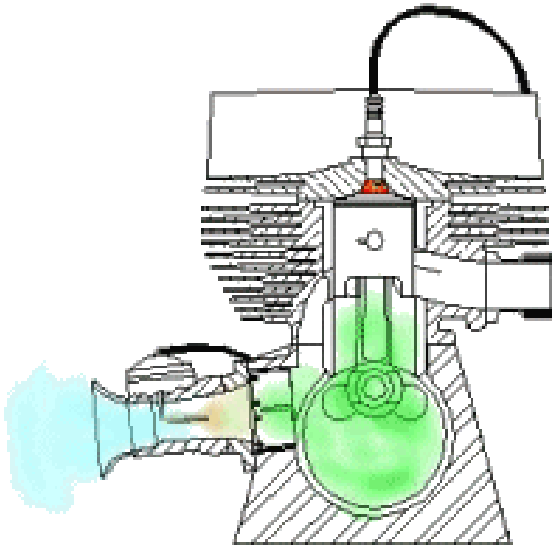

## Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity

Common pollutants of engines

- Oxides of Nitrogen ($NO_x$) – Oxygen and Nitrogen combine to form these compounds with increased temperature and excess air. Lean burn engines generate more NOx.
- Carbon Monoxide (CO) – Major product of incomplete combustion. More CO generated at lower temperatures and at stoicheometric air. Rich burn engines generate more CO.
- Volatile Organic Compounds – Unburned fuel and products of incomplete combustion. Rich burn engines generate more VOC.

## Volatile Organic Compounds

Definition as of 40 CFR 51.100(s)

- Organic Compound
- Any carbon compound that is not, elemental carbon, carbon dioxide, carbon monoxide, carbonic acid, metallic carbides and carbonates and ammonium carbonate.
- Volatile Organic Compounds are Organic Compounds except for what is listed in 40 CFR 51.100(s) which are demonstrated not be Ozone precursors.
- The vast majority of the organic compounds listed as non-ozone precursors are refrigerants (chloro-fluoro hydrocarbons).

## Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity

Other Pollutants

- $SO_2$ – Sulfur Dioxide which is dependent on sulfur content of fuel (note that federal regulations limit diesel sulfur content to 15 ppm)
- Particulates (including breathable particulates)
- Total Hydrocarbons (THC) – all unburned hydrocarbons and products of incomplete combustion
- Non Methane Hydrocarbons (NMHC) – The recommended measurement to quantify VOC.
- Formaldehyde – Product of Incomplete combustion (federally not included in VOC limits).
- Carbon Dioxide – Major product of combustion (greenhouse gas)

## Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity

Heat Input versus Power Output

- Engines are rated by power output in kilowatts
- Power output is on the equipment nameplate
- Heat input is not on the nameplate and one must look at the specifications of the engine.
- Fuel flow rates are in the specification at percent loading (usually 100%, 75%, 50% and 25%).
- For maximum heat input multiply fuel flow at 100% loading by heat capacity of the fuel (142,000 BTU per gallons for diesel, 1020 BTU per cubic foot for natural gas).

## Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity

Advantages and Disadvantages of Types of Fuels

- **Diesel – Advantages** – independent of pipeline, no spark plugs or batteries needed.
- **Diesel – Disadvantages** – during major storm or disaster situations with long term power outages fuel delivery may be difficult. Higher air contaminants in general. Spills cause soil and groundwater pollution.

- **Natural Gas – Advantages** – lower air contaminants, continuous supply.
- **Natural Gas – Disadvantages** – additional maintenance, gas pipeline damage cuts off supply. Gas leaks may cause explosions.

## Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity

- Emissions from Internal Combustion Engines are subject to Federal Requirements of the Clean Air Act Amendments of 1990.
- Both Spark Ignited and Compression Ignited Engines are subject to New Source Performance Standards(NSPS) (40 CFR Part 60).
- Compression Ignition Engines are NSPS Subpart IIII
- Spark Ignition Engines are NSPS Subpart JJJJ
- Both Subparts set pollution standards RICE engines for emergency and non-emergency situations.

## Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity

Major Source Versus Area Source

- Major Source is a facility that has a potential to emit Hazardous Air Pollutants (HAP) greater than or equal to 10 tons per year per individual pollutant and 25 tons per year for all pollutants emitted.
- Area Source are facilities that emit hazardous air pollutants.

Is a facility that has a combustion source an Area Source?

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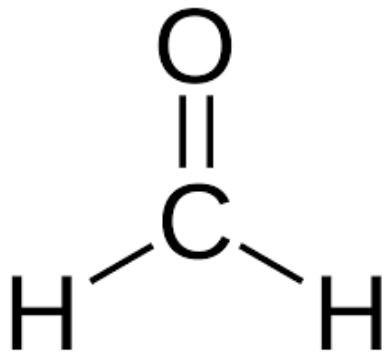


Formaldehyde is a product of incomplete combustion and a hazardous air pollutant

## Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity

Federal NSPS for Compression Ignited RICE Engines (Subpart IIII)

- Sets emission and compliance requirements for manufacturers and owners of the engine for emergency and non-emergency purposes.
- Applies to compression ignited RICE engines ordered by the facility after July 11, 2005 and manufactured after April 1, 2006 (fire pump engines manufactured after July 1, 2006).
- Onus is on the manufacturer to certify the engine for emissions compliance.
- Facility does not need to conduct emissions testing unless engine has greater than 30 liter per cylinder displacement
- Facility needs to install, configure, maintain and operate per manufacturer's instructions.

## Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity

30 liters is about 8 gallons—larger than this water jug.
An engine with cylinders this size would be huge.

## Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity

Federal NSPS for Spark Ignited RICE Engines (Subpart JJJJ)

- Applies to spark ignited RICE engines ordered by facility after June 12, 2006 and for emergency generators manufactured after January 1, 2009 for engines rated greater than 25 horsepower (18.5 kilowatts).
- Onus is on the manufacturer to certify engines for emission compliance that are less than 25 horsepower for non-emergency use, greater than or equal to 25 horsepower burning gasoline and rich burn engines burning LPG.
- The manufacturers of natural gas emergency generators greater than 18.5 kilowatts are not required to conduct emission certification and therefore the onus is on the facility to comply.

## Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity

Manufacturers of Natural Gas fired engines have the option of certifying the engines for compliance.

The emissions standards for natural gas fired engines used for emergency generators rated greater than 25 hp (18.5 kW) and less than 130 hp (96.2 kW) are 10 grams per horsepower hour (g/hp-hr) NOx plus total hydrocarbons (THC) and 387 g/hp-hr CO.

The emissions standards for natural gas fired engines used for emergency generators rated 130 hp (96.2 g/hp-hr) or greater are 2.0 g/hp-hr NOx, 4.0 g/hp-hr CO and 1.0 g/hp-hr VOC (Note that VOC does not include formaldehyde).

Emission standards in parts per million corrected to 15% oxygen are 160 for NOx, 540 for CO and 86 for VOC.

Manufactures that certify must provide the facility a Certificate of Conformity certifying that the engine does comply with the emissions standards.

# United States Environmental Protection Agency
# 2014 Model Year

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If the manufacturer does not have a Certificate of Conformity for the Engine, then facility is required to conduct stack testing to comply with emissions standards. Initial testing must be conducted within 1 year after start up and subsequent testing must be conducted every three years or 8,760 hours of operation whichever comes first.

Stack testing must be conducted by a state certified stack testing firm and must submit a protocol to a state agency for approval and then conduct the testing accompanied by a state official. A certified report needs to be submitted to the state agency.

NOTE THAT THIS APPLIES EVEN IF THE GENERATOR DOES NOT REQUIRE AN AIR PERMIT!

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Recommendations for a Utility Authority purchasing an emergency generator.

- For diesel fired generators the vendor should supply that the facility a Certificate of Conformity which applies to all engine types and sizes.
- For natural gas fired engines the facility should in the bid documents require that the engine has a USEPA Certificate of Conformity.
- Comply with all state permitting requirements.

## Emergency Generator NSPS and MACT Regulations and the Certificate of Conformity

Emergency Generators rated 300 horsepower (222 kilowatts) or greater are subject to Maximum Achievable Control Technology (MACT) standards under the National Emission Standards for Hazardous Air Pollutants (NESHAP) which is Subpart ZZZZ of 40 CFR 63.

Under Subpart ZZZZ for emergency generators greater than 300 hp (222 kW), the facility needs to change the lubricating oil and filter every 500 hours of operation or annually whichever comes first.

The facility must inspect the air cleaner for compression ignition engines and spark plugs (tune up) for spark ignition engines every 1,000 hours of operation or annually whichever comes first.

# Thank You

Richard M. Cestone, PE, CHMM
Senior Project Engineer
Remington & Vernick Engineers
232 King's Highway East
Haddonfield, NJ 08033
Tel No. 856-795-9595 x1903
Fax No. 856-429-5904
Richard.Cestone@rve.com