

EPA's Air Quality Regulations for Stationary Engines

Melanie King
U.S. Environmental Protection Agency

May 2, 2013



EPA's Stationary Engine Regulations

- ▶ National Emission Standards for Hazardous Air Pollutants (NESHAP) for Stationary Reciprocating Internal Combustion Engines (RICE)
 - ▶ 40 CFR part 63 subpart ZZZZ
- ▶ New Source Performance Standards (NSPS) for Stationary Compression Ignition (CI) Internal Combustion Engines (ICE)
 - ▶ 40 CFR part 60 subpart IIII
- ▶ NSPS for Stationary Spark Ignition (SI) ICE
 - ▶ 40 CFR part 60 subpart JJJJ

Why are Engine Emissions a Concern?

- ▶ Pollutants emitted from stationary engines are known or suspected of causing cancer and other serious health effects:
 - ▶ Aggravation of respiratory and cardiovascular disease
 - ▶ Changes in lung function and increased respiratory symptoms
 - ▶ Premature deaths in people with heart or lung disease
 - ▶ Benzene and 1,3-butadiene are known human carcinogens
 - ▶ Noncancer health effects from air toxics may include neurological, cardiovascular, liver, kidney effects, also effects on immune and reproductive systems
- ▶ NO_x and VOC can react in the presence of sunlight to form ozone

These Rules Do Not Apply to:

▶ Engines used in motor vehicles and nonroad equipment:

- Nonroad engines are:
 - Self-propelled (tractors, bulldozers)
 - Propelled while performing their function (lawnmowers)
 - Portable or transportable (has wheels, skids, carrying handles, dolly, trailer, or platform)
 - Portable nonroad becomes stationary if it stays in one location for more than 12 months, or full annual operating period if seasonal source



VS.



Applicability

RICE
NESHAP

- Applies to stationary CI and SI engines, both existing and new

CI ICE
NSPS

- Applies to stationary CI engines:
 - Ordered after July 11, 2005 and manufactured after April 1, 2006
 - Modified or reconstructed after July 11, 2005

SI ICE
NSPS

- Applies to stationary SI engines:
 - Ordered after June 12, 2006 and manufactured on/after
 - July 1, 2007 if ≥ 500 HP (except lean burn $500 \leq \text{HP} < 1,350$)
 - January 1, 2008 if lean burn $500 \leq \text{HP} < 1,350$
 - July 1, 2008 if < 500 HP
 - January 1, 2009 if emergency > 25 HP
 - Modified or reconstructed after June 12, 2006

Stationary RICE NESHAP

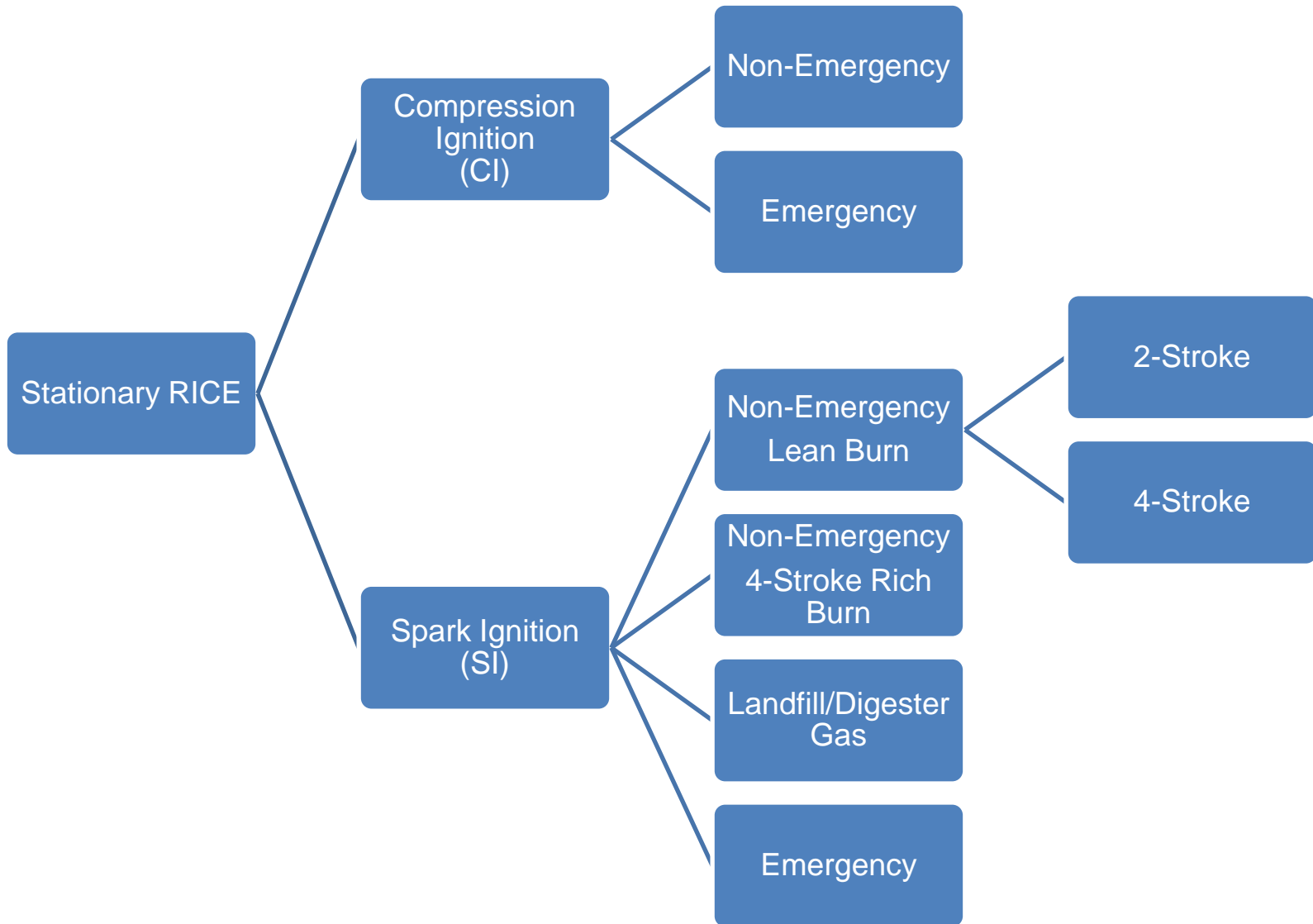
Background

RICE NESHAP Background

- ▶ Regulates HAP emissions from stationary RICE at both major and area sources of HAP
 - ▶ Major: ≥ 10 tons/year single HAP or ≥ 25 tons/year total HAP
 - ▶ Area: not major
- ▶ All sizes of engines are covered



General Subcategorization Approach



Existing vs. New

Construction commenced before:

>500 HP at major source

Existing

December 19, 2002

New

≤500 HP at major source,
and all HP at area source

Existing

June 12, 2006

New

- ▶ Determining construction date: owner/operator has entered into a **contractual obligation** to undertake and complete, within a reasonable amount of time, a continuous program for the **on-site installation** of the engine
 - ▶ Does not include moving an engine to a new location

RICE NESHAP Applicability

- ▶ **ONLY STATIONARY ENGINES NOT SUBJECT:** existing emergency engines located at residential, institutional, or commercial area sources used or obligated to be available ≤ 15 hr/yr for emergency demand response or voltage/frequency deviation, and not used for local reliability
 - ▶ residential: includes homes, apartment buildings
 - ▶ commercial: includes office buildings, hotels, stores, telecommunications facilities, restaurants, financial institutions, doctor's offices, sports and performing arts facilities
 - ▶ institutional: includes medical centers, nursing homes, research centers, institutions of higher education, correctional facilities, elementary and secondary schools, libraries, religions establishments, police stations, fire stations

Stationary RICE NESHAP

Requirements for Emergency RICE
at Area Sources of HAP

Emergency Engine Operational Limitations

- ▶ Unlimited use for emergencies (e.g., power outage, fire, flood)
- ▶ 100 hr/yr for:
 - ▶ maintenance/testing
 - ▶ emergency demand response (EDR) when Energy Emergency Alert Level 2 has been declared by Reliability Coordinator
 - ▶ voltage or frequency deviates by 5% or more below standard
- ▶ 50 hr/yr of the 100 hr/yr allocation can be used for:
 - ▶ non-emergency situations if no financial arrangement
 - ▶ local reliability as part of a financial arrangement with another entity if:
 - existing RICE at area source
 - engine is dispatched by local transmission/distribution system operator
 - dispatch intended to mitigate local transmission and/or distribution limitations so as to avert potential voltage collapse or line overloads
 - dispatch follows reliability, emergency operation, or similar protocols that follow specific NERC, regional, state, public utility commission, or local standards or guidelines
 - power provided only to facility or to support local distribution system
 - owner/operator identifies and records dispatch and standard that is being followed
 - ▶ peak shaving in local system operator program until May 3, 2014 if existing RICE at area source

Compliance Requirements: Emergency Engines at Area Sources

Existing engine:

- ▶ Change oil/filter & inspect hoses/ belts every 500 hours or annually; inspect air cleaner (CI) or spark plugs (SI) every 1,000 hours or annually
 - ▶ May use oil analysis program
- ▶ Operate/maintain per manufacturer's instructions or owner-developed maintenance plan
- ▶ Minimize startup/idle
- ▶ Non-resettable hour meter
- ▶ Records of hours of operation and maintenance
- ▶ Initial notifications NOT required

New engine:

- ▶ Meet Stationary Engine NSPS
 - ▶ part 60 subpart IIII if CI; part 60 subpart JJJJ if SI

Oil Analysis Programs

Parameter	Condemning Limits
Total Base Number (CI RICE only)	<30% of the TBN of the oil when new
Total Acid Number (SI RICE only)	Increases by more than 3.0 mg of potassium hydroxide per gram from TAN of the oil when new
Viscosity	Changed by more than 20% from the viscosity of the oil when new
% Water Content by volume	>0.5

- ▶ Oil analysis must be performed at same frequency specified for oil changes
- ▶ If condemned, change oil within 2 business days
 - ▶ Owner/operator must keep records of the analysis

Fuel Requirements for Emergency Engines

- ▶ Requirements apply to emergency CI RICE >100 HP and displacement <30 liters/cylinder that are:
 - ▶ Operated or contractually obligated to be available >15 hr/yr (up to 100 hr/yr) for emergency demand response or voltage/frequency deviation, or
 - ▶ Operated for local reliability (up to 50 hr/yr)
- ▶ Beginning January 1, 2015, use ultra low sulfur diesel fuel
 - ▶ Existing inventory may be depleted

Reporting Requirements for Emergency Engines

- ▶ Requirements apply to emergency RICE >100 HP that are:
 - ▶ Operated or contractually obligated to be available >15 hr/yr (up to 100 hr/yr) for emergency demand response or voltage/frequency deviation, or
 - ▶ Operated for local reliability (up to 50 hr/yr)
- ▶ Beginning with 2015 operation, report electronically by March 31 of following year:
 - ▶ Facility name/address
 - ▶ Engine rating, model year, lat/long
 - ▶ Date, start time, end time for operation for purposes above
 - ▶ Number of hours engine is contractually obligated for emergency demand response or voltage/frequency deviation
 - ▶ Entity that dispatched engine for local reliability and situation that necessitated dispatch
 - ▶ Deviations from fuel requirement
- ▶ Submit report electronically through the Compliance and Emissions Data Reporting Interface
 - ▶ Accessed through EPA's Central Data Exchange at <http://www.epa.gov/cdx>

Stationary RICE NESHAP

Requirements for Non-Emergency RICE at
Area Sources of HAP

Emission Standards: Existing Non-Emergency RICE at Area Sources

HP	Engine Subcategory				
	Non-emergency				
	CI	SI 2SLB	SI 4S in remote areas	SI 4S not in remote areas	SI LFG/DG
≤300	Change oil/filter & inspect air cleaner every 1,000 hours or annually; inspect hoses/belts every 500 hours or annually	Change oil/filter, inspect spark plugs, & inspect hoses/belts every 4,320 hours or annually	Change oil/ filter, inspect spark plugs, & inspect hoses/belts every 1,440 hours of operation or annually		Change oil/ filter, inspect spark plugs, & inspect hoses/ belts every 1,440 hours of operation or annually
300-500	49 ppm CO or 70% CO reduction				
>500	23 ppm CO or 70% CO reduction		Change oil/ filter, inspect spark plugs, & inspect hoses/belts every 2,160 hours of operation or annually	If engine used >24 hrs/yr: 4SLB: Install oxidation catalyst 4SRB: Install NSCR	

New Non-Emergency RICE Located at Area Sources: meet Stationary Engine NSPS

- part 60 subpart IIII if CI; part 60 subpart JJJJ if SI

Compliance Requirements: Non-Emergency Engines at Area Sources

Engine Subcategory	Compliance Requirements
<ul style="list-style-type: none">• Existing non-emergency CI >300 HP at area source	<ul style="list-style-type: none">• Initial emission performance test• Subsequent performance testing every 8,760 hours of operation or 3 years for engines >500 HP (5 years if limited use)• Operating limitations - catalyst pressure drop and inlet temperature for engines >500 HP• Notifications• Semiannual compliance reports (annual if limited use)• Ultra low sulfur diesel (ULSD)• Crankcase emission control requirements
<ul style="list-style-type: none">• Existing non-emergency SI 4SLB/4SRB >500 HP at area source used >24 hours/year and not in remote area	<ul style="list-style-type: none">• Initial and annual catalyst activity checks• High temperature engine shutdown or continuously monitor catalyst inlet temperature• Notifications• Semiannual compliance reports

Compliance Requirements: Non-Emergency Engines at Area Sources

Engine Subcategory	Compliance Requirements
<p><u>Existing non-emergency:</u></p> <ul style="list-style-type: none">•black start at area source•CI ≤300 HP at area source•SI ≤500 HP at area source•SI 2SLB >500 HP at area source•SI LFG/DG >500 HP at area source•SI 4SLB/4SRB >500 HP at area source used ≤24 hours/year or in remote area	<ul style="list-style-type: none">•Operate/maintain engine & control device per manufacturer's instructions or owner-developed maintenance plan•May use oil analysis program instead of prescribed oil change frequency•Keep records of maintenance•Notifications not required

Key Dates

- ▶ Initial applicability notifications for engines subject to notification requirements were due by:
 - ▶ August 31, 2010 for existing CI RICE
 - ▶ February 16, 2011 for existing SI RICE

- ▶ Compliance dates:
 - ▶ June 15, 2007
 - Existing RICE >500 HP at major sources (except non-emergency CI >500 HP at major sources)
 - ▶ **May 3, 2013**
 - Existing CI RICE (except emergency CI >500 HP at major sources)
 - ▶ **October 19, 2013**
 - Existing SI RICE ≤500 HP at major sources and all HP at area sources
 - ▶ Upon startup for new engines

Stationary CI ICE NSPS

CI ICE NSPS Applicability

▶ CI Engines:

- ▶ constructed (**ordered**) after July 11, 2005 **and** manufactured after April 1, 2006 (July 1, 2006 for fire pump engines)
- ▶ modified/reconstructed after July 11, 2005

Note: engine manufacturers must certify 2007 model year and later stationary CI engines <30 liters/cylinder displacement

Emission Standards

▶ <30 liters/cylinder

- ▶ Meet Tier standards equivalent to standards for nonroad engines

▶ ≥30 liters/cylinder

- ▶ NO_x limits (g/kW-hr): equivalent to EPA standards for large marine engines
- ▶ PM limit:
 - 60% reduction or 0.15 g/kW-hr for non-emergency
 - 0.40 g/kW-hr for emergency



Fuel Requirements

Date	Requirement
October 1, 2007	Low sulfur diesel (LSD)
October 1, 2010 Engines <30 liters/cylinder displacement	Ultra low sulfur diesel (ULSD) •Max sulfur content 15 ppm •Minimum cetane index of 40 or max aromatic content of 35 volume %
June 1, 2012 Engines ≥30 liters/cylinder displacement	1,000 ppm sulfur diesel

Engine Manufacturer Compliance Requirements

- ▶ Engine manufacturers must certify 2007 model year and later engines with a displacement <30 liters/cylinder
 - ▶ Certification = EPA Certificate of Conformity



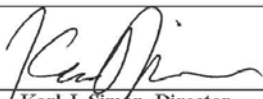


**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2012 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT OF 1990**

**OFFICE OF TRANSPORTATION
AND AIR QUALITY
ANN ARBOR, MICHIGAN 48105**

Certificate Issued To: Perkins Engines Co Ltd
(U.S. Manufacturer or Importer)
Certificate Number: CPKXL04.4NJ1-007

Effective Date:
09/02/2011
Expiration Date:
12/31/2012


Karl J. Simon, Director
Compliance and Innovative Strategies Division

Issue Date:
09/02/2011
Revision Date:
N/A

Model Year: 2012
Manufacturer Type: Original Engine Manufacturer
Engine Family: CPKXL04.4NJ1

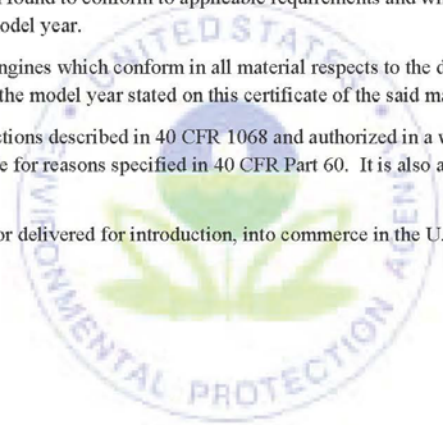
Mobile/Stationary Indicator: Stationary
Emissions Power Category: $75 \leq kW < 130$
Fuel Type: Non-Standard Fuel, Diesel
After Treatment Devices: No After Treatment Devices Installed
Non-after Treatment Devices: Electronic Control

Pursuant to Section 111 and Section 213 of the Clean Air Act (42 U.S.C. sections 7411 and 7547) and 40 CFR Part 60, 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 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 compression-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.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068 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 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.



Owner/Operator Compliance Requirements

- ▶ 2007 model year and later with displacement <30 liters/cylinder*
 - ▶ purchase certified engine
 - ▶ Install, configure, operate and maintain engine per manufacturer's instructions or manufacturer-approved procedures
 - Owner/operator performance testing not required
 - ▶ If operate differently than manufacturer's recommendations, must do performance test to show compliance

- ▶ Displacement ≥ 30 liters/cylinder
 - ▶ Initial performance test
 - ▶ Annual performance test for non-emergency engine
 - ▶ Continuously monitor operating parameters

Monitoring/Recordkeeping/Reporting

Engine Type	Requirement
Emergency Engines	<ul style="list-style-type: none">•Non-resettable hour meter and records of operation if engine does not meet non-emergency engine standards
Equipped with diesel particulate filter (DPF)	<ul style="list-style-type: none">•Backpressure monitor and records of corrective actions
Non-emergency >3,000 HP or with displacement >10 liters/cylinder and Pre-2007 model year >175 HP that are not certified	<ul style="list-style-type: none">•Submit initial notification•Keep records of notifications and engine maintenance•If certified, keep records of documentation of engine certification•If not certified, keep records of compliance demonstrations

Stationary SI ICE NSPS

SI ICE NSPS Applicability

- ▶ SI engines constructed (**ordered**) after June 12, 2006 **and**

Manufactured On/After	Engine Type
July 1, 2007	≥ 500 HP (except lean burn $500 \leq \text{HP} < 1,350$)
January 1, 2008	Lean burn $500 \leq \text{HP} < 1,350$
July 1, 2008	< 500 HP
January 1, 2009	Emergency > 25 HP

- ▶ Modified/reconstructed after June 12, 2006

Note: engine manufacturers must certify stationary SI engines ≤ 25 HP and engines > 25 HP that are gasoline or rich burn LPG

Emission Standards (In General)

Engine	Standards
≤25 HP (all engines)	Part 90 or part 1054 standards for new nonroad SI engines
Non-emergency gasoline and rich burn LPG	Part 1048 standards for new nonroad SI engines
Non-emergency natural gas and lean burn LPG 25<HP<100	Part 1048 standards for new nonroad SI engines (or other options)
≥100 HP and not gasoline or rich burn LPG	Standards in Table 1 of subpart JJJJ, part 1048 standards for some engines

Owners/operators of gasoline engines must use gasoline that meets the sulfur limit in 40 CFR 80.195 – cap of 80 ppm

Compliance Requirements for Owners/Operators

▶ Certified engines

- ▶ Install, configure, operate and maintain engine according to manufacturer's instructions
- ▶ If you do not operate/maintain according to manufacturer's instructions:
 - keep maintenance plan and maintenance records
 - operate consistent with good air pollution control practices
 - $100 \leq \text{HP} \leq 500$ – initial performance test
 - >500 HP – initial performance test and subsequent every 8,760 hours or 3 years, whichever is first

Compliance Requirements for Owners/Operators

▶ Non-certified engines:

- ▶ Maintenance plan
- ▶ Performance testing
 - $25 < \text{HP} \leq 500$ – initial test
 - > 500 HP - initial test and subsequent every 8,760 hours or 3 years, whichever is first
 - Conduct within 10% of peak (or highest achievable) load

▶ Monitoring/recordkeeping/reporting includes:

- ▶ Non-resettable hour meter and records of operation for emergency engines
- ▶ Documentation of certification
- ▶ Records of engine maintenance
- ▶ Initial notification for non-certified engines > 500 HP
- ▶ Results of performance testing within 60 days of test

Implementation Assistance

- ▶ RICE NESHAP/NSPS TTN websites

- ▶ <http://www.epa.gov/ttn/atw/rice/ricepg.html>

- ▶ <http://www.epa.gov/ttn/atw/nsps/cinsps/cinspspg.html>

- ▶ <http://www.epa.gov/ttn/atw/nsps/sinsps/sinspspg.html>

- ▶ EPA Regional Office RICE websites

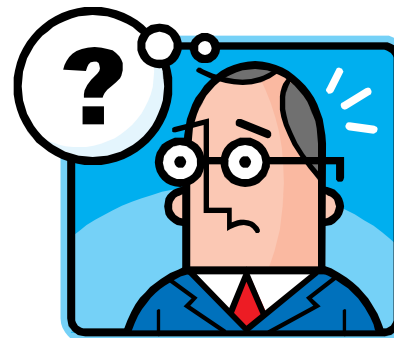
- ▶ Region 1: <http://www.epa.gov/region1/rice>

- ▶ Region 10:

- http://yosemite.epa.gov/R10/airpage.nsf/Enforcement/rice_rules

- ▶ Electronic CFR

- ▶ <http://www.gpoaccess.gov/ecfr>



Contact Information

Melanie King

Energy Strategies Group

Sector Policies and Programs Division

Office of Air Quality Planning and Standards

Office of Air and Radiation

Phone: 919-541-2469

king.melanie@epa.gov

Appendix

RICE NESHAP Requirements for Major Sources of HAP

Emission Standards: Existing RICE at Major Sources

HP	Engine Subcategory					
	Non-emergency					Emergency
	CI	SI 2SLB	SI 4SLB	SI 4SRB	SI LFG/DG	
<100	Change oil and filter and inspect air cleaner (CI) or spark plugs (SI) every 1,000 hours of operation or annually; inspect hoses and belts every 500 hours of operation or annually					Change oil/filter & inspect hoses/belts every 500 hours or annually; inspect air cleaner (CI) or spark plugs (SI) every 1,000 hours or annually
100-300	230 ppm CO	225 ppm CO	47 ppm CO	10.3 ppm CH ₂ O	177 ppm CO	
300-500	49 ppm CO or 70% CO reduction					
>500	23 ppm CO or 70% CO reduction	No standards	No standards	350 ppb CH ₂ O or 76% CH ₂ O reduction	No standards	No standards

Note: Existing limited use engines >500 HP at major sources do not have to meet any emission standards. Existing black start engines ≤500 HP at major sources must meet work practice standards.

Emission Standards – New RICE at Major Sources

HP	Engine Subcategory					
	Non-emergency					Emergency
	CI	SI 2SLB	SI 4SLB	SI 4SRB	SI LFG/DG	
<250	Comply with CI NSPS	Comply with SI NSPS	Comply with SI NSPS	Comply with SI NSPS	Comply with SI NSPS	Comply with CI/SI NSPS
250-500			14 ppm CH ₂ O or 93% CO reduction			
>500	580 ppb CH ₂ O or 70% CO reduction	12 ppm CH ₂ O or 58% CO reduction		350 ppb CH ₂ O or 76% CH ₂ O reduction	No standards	No standards

Note: New limited use engines >500 HP at major sources do not have to meet any emission standards under the NESHAP.



Compliance Requirements: RICE at Major Sources

Engine Subcategory	Compliance Requirements
<p><u>Existing non-emergency:</u></p> <ul style="list-style-type: none">• CI \geq100 HP at major source• SI 100-500 HP at major source	<ul style="list-style-type: none">• Initial emission performance test• Subsequent performance testing every 8,760 hours of operation or 3 years for engines >500 HP (5 years if limited use)• Operating limitations - catalyst pressure drop and inlet temperature for engines >500 HP• Notifications• Semiannual compliance reports (annual if limited use) <p>Existing non-emergency CI >300 HP:</p> <ul style="list-style-type: none">• Ultra low sulfur diesel (ULSD)• Crankcase emission control requirements

Compliance Requirements: RICE at Major Sources

Engine Subcategory	Compliance Requirements
<p><u>Existing non-emergency:</u></p> <ul style="list-style-type: none"> •SI 4SRB >500 HP at major source <p><u>New non-emergency:</u></p> <ul style="list-style-type: none"> •SI 2SLB >500 HP at major source •SI 4SLB >250 HP at major source •SI 4SRB >500 HP at major source •CI>500 HP at major source 	<ul style="list-style-type: none"> •Initial emission performance test •Subsequent performance testing semiannually (can reduce frequency to annual)* •Operating limitations - catalyst pressure drop and inlet temperature •Notifications •Semiannual compliance reports
<ul style="list-style-type: none"> •New emergency/limited use >500 HP at major source 	<ul style="list-style-type: none"> •Initial notification •Reporting and ULSD for emergency engines used for emergency demand response
<ul style="list-style-type: none"> •New non-emergency LFG/DG >500 HP at major source 	<ul style="list-style-type: none"> •Initial notification •Monitor/record fuel usage daily •Annual report of fuel usage

*Subsequent testing required for 4SRB engine complying with formaldehyde % reduction standard only if engine is $\geq 5,000$ HP

Compliance Requirements: RICE at Major Sources

Engine Subcategory	Compliance Requirements
<ul style="list-style-type: none">•Existing emergency/black start ≤ 500 HP at major source•Existing non-emergency < 100 HP at major source	<ul style="list-style-type: none">•Operate/maintain engine & control device per manufacturer's instructions or owner-developed maintenance plan•May use oil analysis program instead of prescribed oil change frequency•Emergency engines must have hour meter and record hours of operation•Keep records of maintenance•Notifications not required•Reporting and ULSD for emergency engines > 100 HP used for emergency demand response