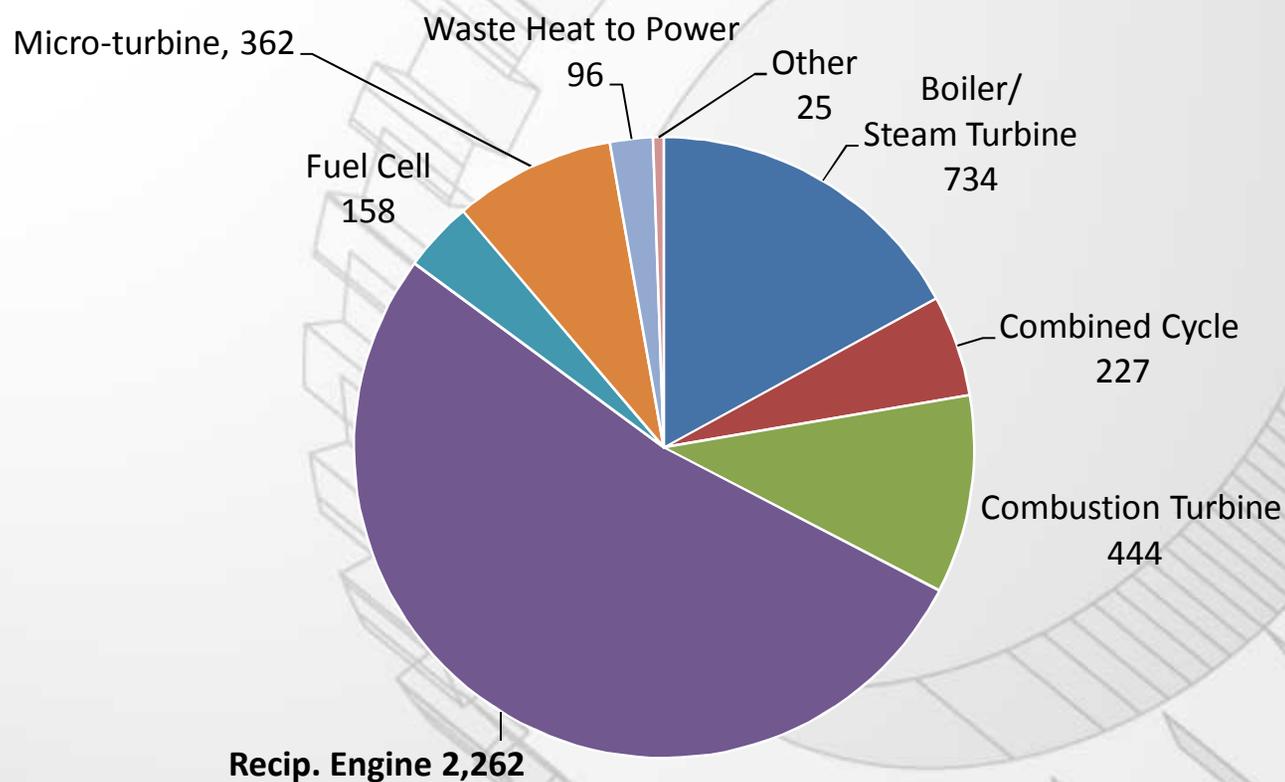




# **EPA's Air Quality Rules for Reciprocating Internal Combustion Engines and their Application to Combined Heat and Power**

# RICE are 52% of total CHP prime movers



ICF CHP Installation Database, 2014

# Agenda

**Introduction – Gary McNeil, EPA Combined Heat and Power Partnership**

**How EPA Air Quality Regulations Affect Combined Heat and Power Facilities**

**- Roy Crystal, EPA Region I**

**EPA's Air Quality Regulations for Stationary RICE**

**- Melanie King, U.S. EPA Office of Air Quality Planning & Standards**

**Question and Answer Session 1**

**- Susan Lancey, EPA Region I**

**How Combined Heat and Power Facilities Can Comply with EPA Air Quality Regulations for Stationary RICE**

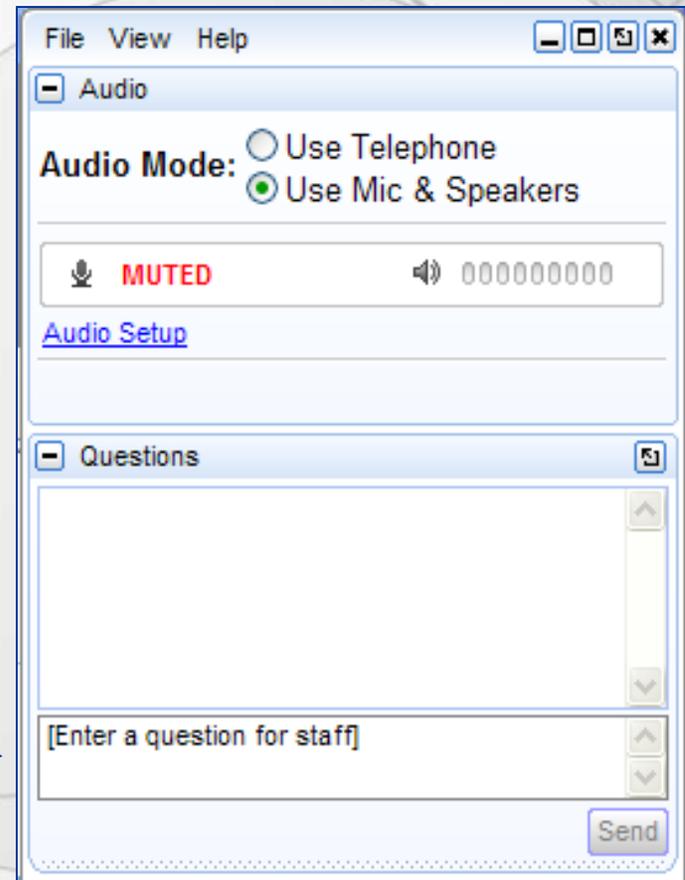
**- Roy Crystal, EPA Region I**

**Question and Answer Session 2**

**- Susan Lancey, EPA Region I**

# Webinar Logistics

- All attendees will be muted throughout this webinar.
- If you have a question for the presenters or are having difficulty with the webinar software, please submit your question for webinar staff via the Questions box.



# Polls and Survey Questions

- Two polls today
- At the end of the webinar, a feedback survey will appear on your screen.
- Please take a moment to complete this survey.

# Webinar Slides and Recording

- Slides from today's webinar presentations and the question and answer log will be available in PDF on the CHP website next week:  
<http://www.epa.gov/chp/events/webinars.html>.
- Today's webinar is being recorded. The recording will be available tomorrow morning at:  
<https://www2.gotomeeting.com/register/164471538>

# Welcome and Introduction

- What is the EPA CHP Partnership Program ?
  - Non-regulatory program
  - Since 2001
  - 510 Partners
    - 1745 operational projects
    - 3070 MW
  - Work to remove barriers to CHP deployment
    - Provide technical information
    - Advance favorable policies
    - Raise awareness and understanding

# EPA's Air Quality Rules for Reciprocating Internal Combustion Engines and their Application to Combined Heat and Power

Roy Crystal  
US EPA Region 1  
Boston, Massachusetts



# How Operators of Combined Heat and Power Facilities Can Comply with EPA Air Quality Regulations for Stationary Engines



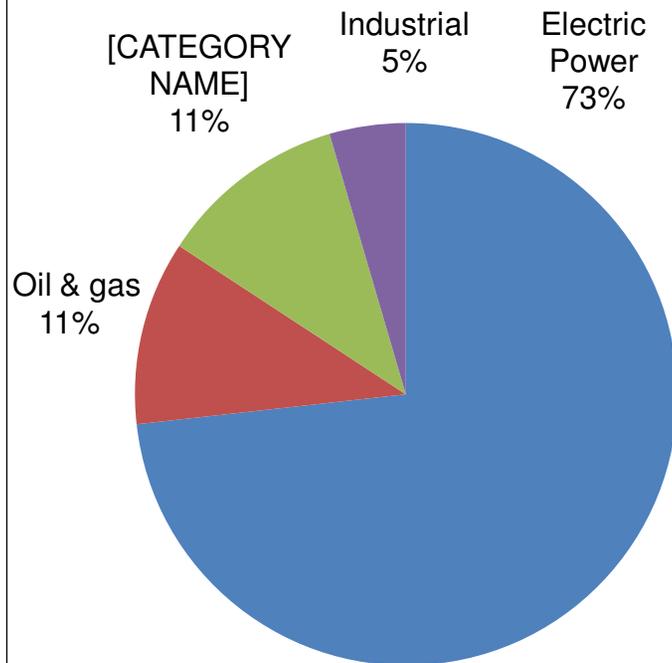
Roy Crystal, EPA Region 1  
(New England)

Webinar on EPA's Air Quality  
Regulations for Stationary  
Engines & Combined Heat &  
Power

June 24, 2014

# Stationary Engines at a Glance

## Applications



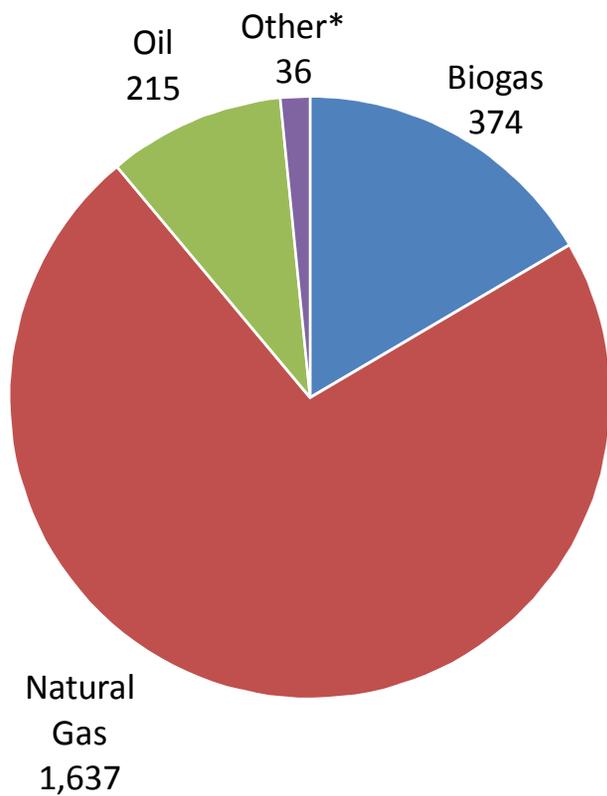
- ~1.5 million stationary engines in U.S.
  - 78% Compression Ignition (CI), 22% Spark Ignition (SI)
  - ~ 900,000 used for emergency power
- Sizes range from 1 kW to >10 MW
- Main Hazardous Air Pollutants (HAP) emitted: formaldehyde, acetaldehyde, acrolein, methanol, and PAH
- Main criteria pollutants emitted: NO<sub>x</sub>, CO, VOC, PM

# Why are Engine Emissions a Concern?

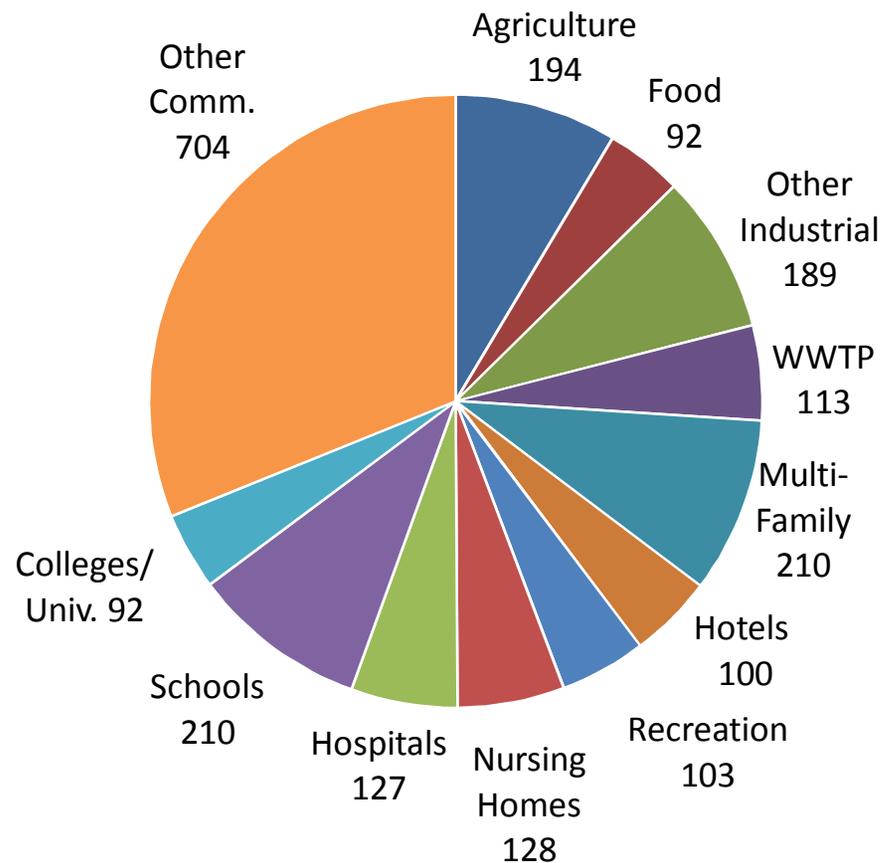
- Pollutants emitted from stationary engines are known or suspected of causing cancer and other serious health effects:
  - Aggravation of respiratory and cardiovascular disease
  - Changes in lung function and increased respiratory symptoms
  - Premature deaths in people with heart or lung disease
  - Benzene and 1,3-butadiene are known human carcinogens
  - Noncancer health effects from air toxics on neurological, cardiovascular, immune, reproductive systems; liver, kidney.
- NO<sub>x</sub> and VOC can react in presence of sunlight to form ozone
- Combustion releases greenhouse gases – carbon dioxide, methane, nitrous oxides

# CHP in Reciprocating Engines in US by Fuel & Sector

CHP in Recip. Engines by Fuel (# of Sites)



CHP in Recip. Engines by Market Sector (# of Sites)



\*Note: Other includes coal, wood and waste

Source: ICF CHP Installation Database, 2014

# EPA Air Quality Regulations & Combined Heat and Power

- Reciprocating internal combustion engines (RICE) are common prime movers for combined heat & power units
- EPA's air quality regulations for stationary RICE are recent
- EPA RICE regulations vary by engine type - may require meeting emission limits, installing controls, notifications, and stack testing
- Facilities & consultants more familiar with state air permitting; awareness of EPA engine air quality regulations may be limited
- You may be out of compliance – but we'll show you how to comply!

# 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

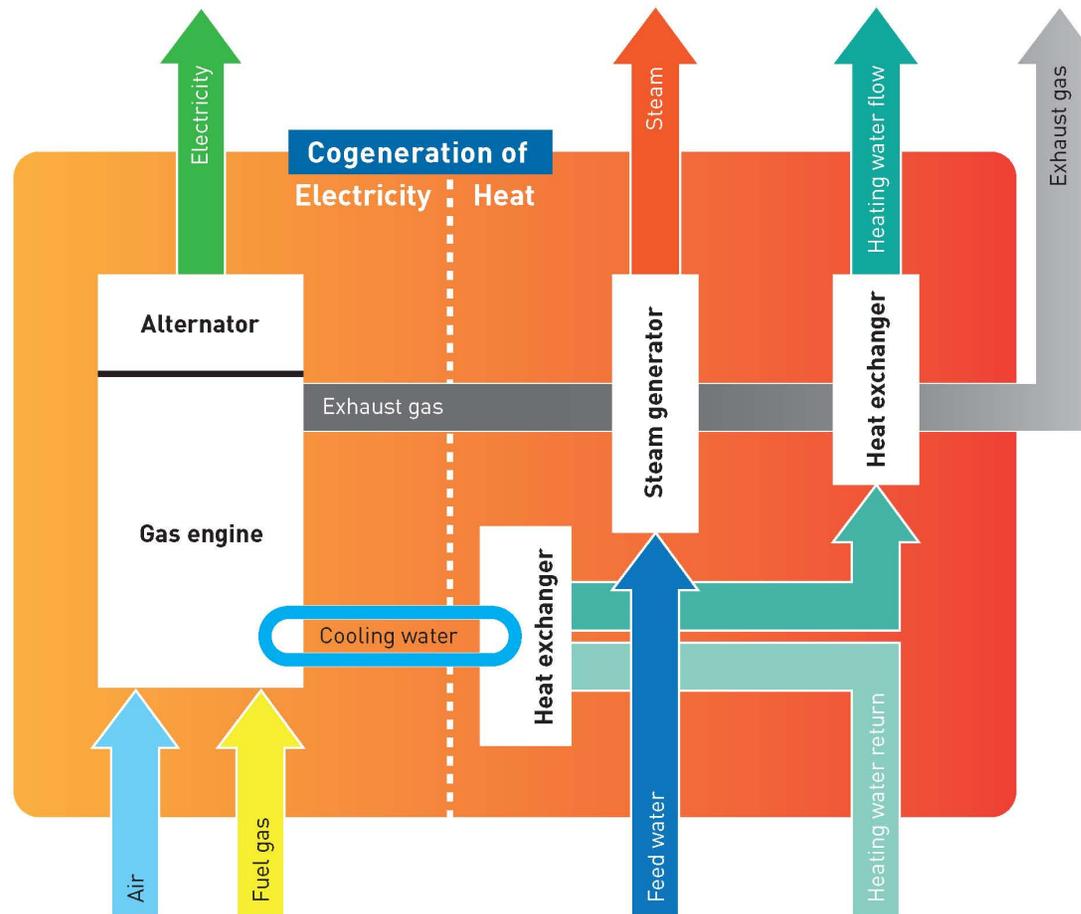
# RICE NESHAP & NSPS Overview

- RICE NESHAP regulates HAP emissions from stationary RICE at both major and area sources of HAP
  - All sizes of engines are covered
  - Covers both new & existing RICE
  - Defers to NSPS for certain engines
  - EPA has worked to harmonize RICE NSPS & NESHAP
- RICE NSPS standards regulate new, modified, and reconstructed sources, not existing; control is for criteria pollutants
- NSPS covers different types of RICE beginning in 2005
- Over time NSPS standards will become more pervasive

# Possible RICE Uses at a Facility with a CHP Unit

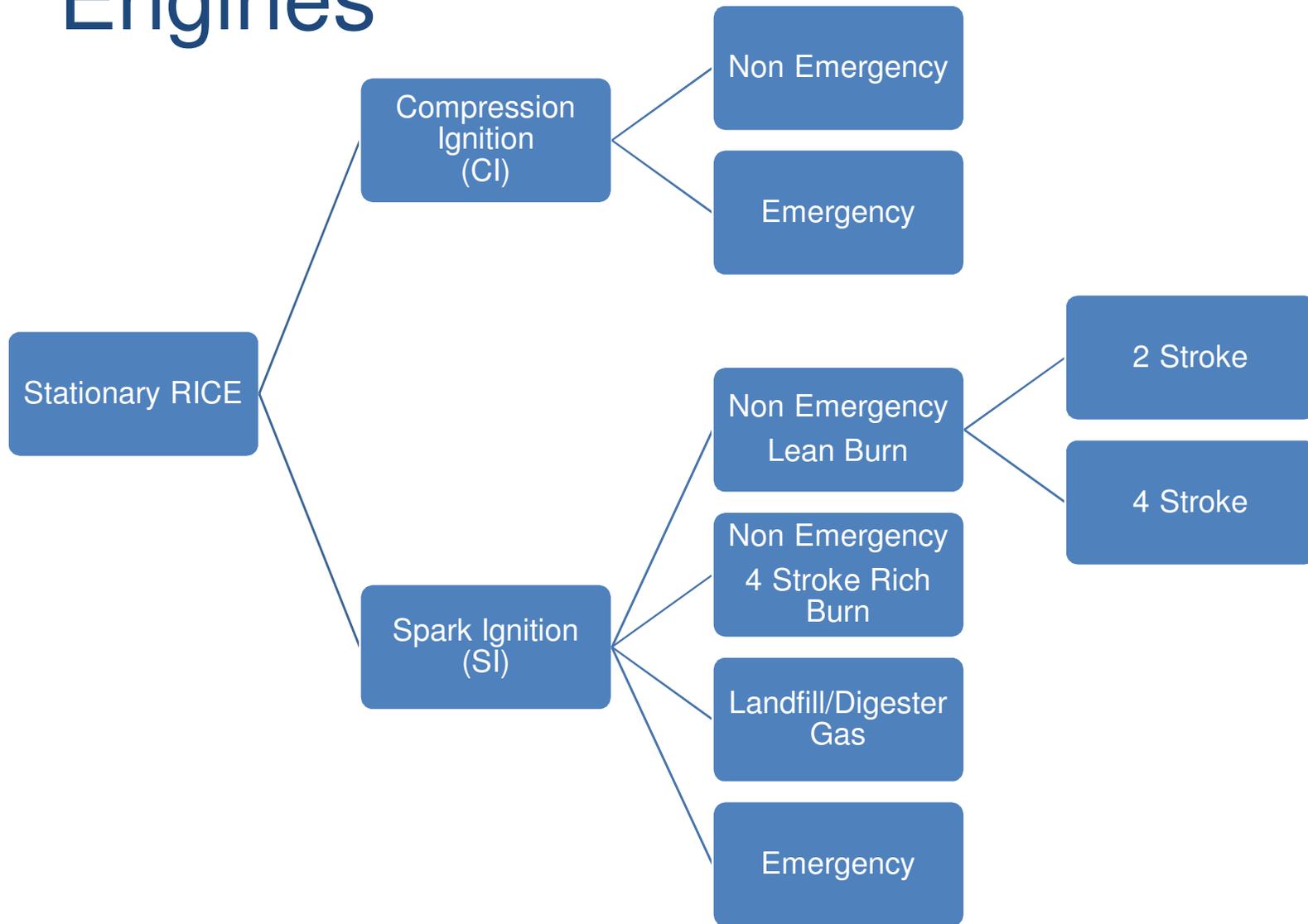
- Prime mover for CHP unit - non-emergency use
- “Emergency generator” - generate backup power in an emergency
- Operate generator as part of a financial arrangement - for peak shaving (load management), emergency demand response, or local grid reliability
- Other possible non-emergency uses:
  - Non-emergency power generation (distributed generation)
  - Run emergency generator in a storm or prior to possible loss of grid power to maintain readiness
  - Fire pumps?

# CHP with Engine as Prime Mover



Source: MWM, Cogeneration & Trigenation Plants,  
<http://www.mwm.net/en/competencies/decentralized-energy-supply/cogeneration-trigenation-plants/>

# How EPA Regulations Classify Engines



# EPA's Air Quality Rules for Reciprocating Internal Combustion Engines and their Application to Combined Heat and Power

Melanie King

US EPA Office of Air Quality Planning and Standards

Research Triangle Park, North Carolina



# EPA's Air Quality Regulations for Stationary Engines

Melanie King  
U.S. Environmental Protection Agency

June 24, 2014

# Applicability

## RICE NESHAP

40 CFR part 63  
subpart ZZZZ

- Applies to existing and new stationary compression ignition (CI) and spark ignition (SI) engines

## CI ICE NSPS

40 CFR part 60  
subpart IIII

- 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

40 CFR part 60  
subpart JJJJ

- Applies to stationary SI engines:
  - Ordered after June 12, 2006 and manufactured on/after
    - July 1, 2007 if  $\geq 500$  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

# These Rules Do Not Apply to:

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- ▶ Engines used in motor vehicles and mobile nonroad equipment:
  - ▶ Mobile 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.



# Stationary Reciprocating Internal Combustion Engine NESHAP

# RICE NESHAP Background

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- ▶ Regulates HAP emissions from stationary RICE at both major and area sources of HAP
  - ▶ Major:  $\geq 10$  tons/year single HAP or  $\geq 25$  tons/year total HAP
  - ▶ Area: not major
  
- ▶ **All sizes** of engines are covered
  
- ▶ **Only stationary engines not subject**: existing emergency engines located at residential, institutional, or commercial area sources used or obligated to be available  $\leq 15$  hr/yr for emergency demand response or voltage/frequency deviation, and not used for local reliability

# Existing vs. New

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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

# Stationary Reciprocating Internal Combustion Engine 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				
	Compression Ignition	Spark Ignition 2SLB	Spark Ignition 4S in remote areas	Spark Ignition 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

# How is “Remote” Defined?

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- ▶ Remote defined as:
  - ▶ Located in offshore area; or
  - ▶ Located on a pipeline segment with 10 or fewer buildings intended for human occupancy and no buildings with 4 or more stories within 220 yards on either side of a continuous 1-mile length of pipeline (DOT Class 1 area), and the pipeline segment is not within 100 yards of a building or small well-defined outside area (playground, etc.) occupied by 20 or more persons on at least 5 days a week for 10 weeks in any 12-month period; or
  - ▶ Not located on a pipeline and having 5 or fewer buildings intended for human occupancy and no buildings with 4 or more stories within a 0.25 mile radius around the engine
- ▶ Engine must have met remote definition as of October 19, 2013

# Compliance Requirements: Non-Emergency Engines at Area Sources

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

# Compliance Requirements: Non-Emergency Engines at Area Sources

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

# 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

# Stationary Reciprocating Internal Combustion Engine NESHAP

Requirements for Emergency RICE  
at Area Sources of HAP

# What is an Emergency Engine?

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- ▶ “. . . operated to provide electrical power or mechanical work during an emergency situation. Examples include stationary RICE used to produce power for critical networks or equipment . . . when electric power from the local utility . . . is interrupted, or stationary RICE used to pump water in the case of fire or flood, etc.”
- ▶ Operates in non-emergency situations only as specified in the rule

# Emergency Engine Operational Limitations

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- ▶ 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

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## 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

# Fuel Requirements for Emergency Engines

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- ▶ 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

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- ▶ 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>

# Key Dates

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- ▶ 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 Compression Ignition Internal Combustion Engine NSPS

# CI ICE NSPS Applicability

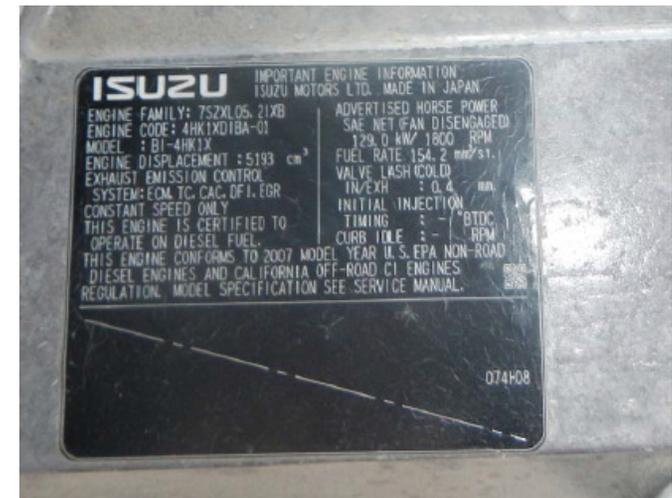
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- ▶ Owners/operators of CI engines:
  - ▶ constructed (**ordered**) after July 11, 2005 **and** manufactured after April 1, 2006 (July 1, 2006 for fire pump engines)
  - ▶ modified/reconstructed after July 11, 2005
  
- ▶ Manufacturers of 2007 model year and later CI engines:
  - ▶ “*Manufacturer . . .* includes any person who manufactures a stationary engine for sale in the United States or otherwise introduces a new stationary engine into commerce in the United States. This includes importers who import stationary engines for sale or resale.”

# 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	 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		Expiration Date: 12/31/2012		Mobile/Stationary Indicator: Stationary Emissions Power Category: 75<=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 <i>ab initio</i> 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

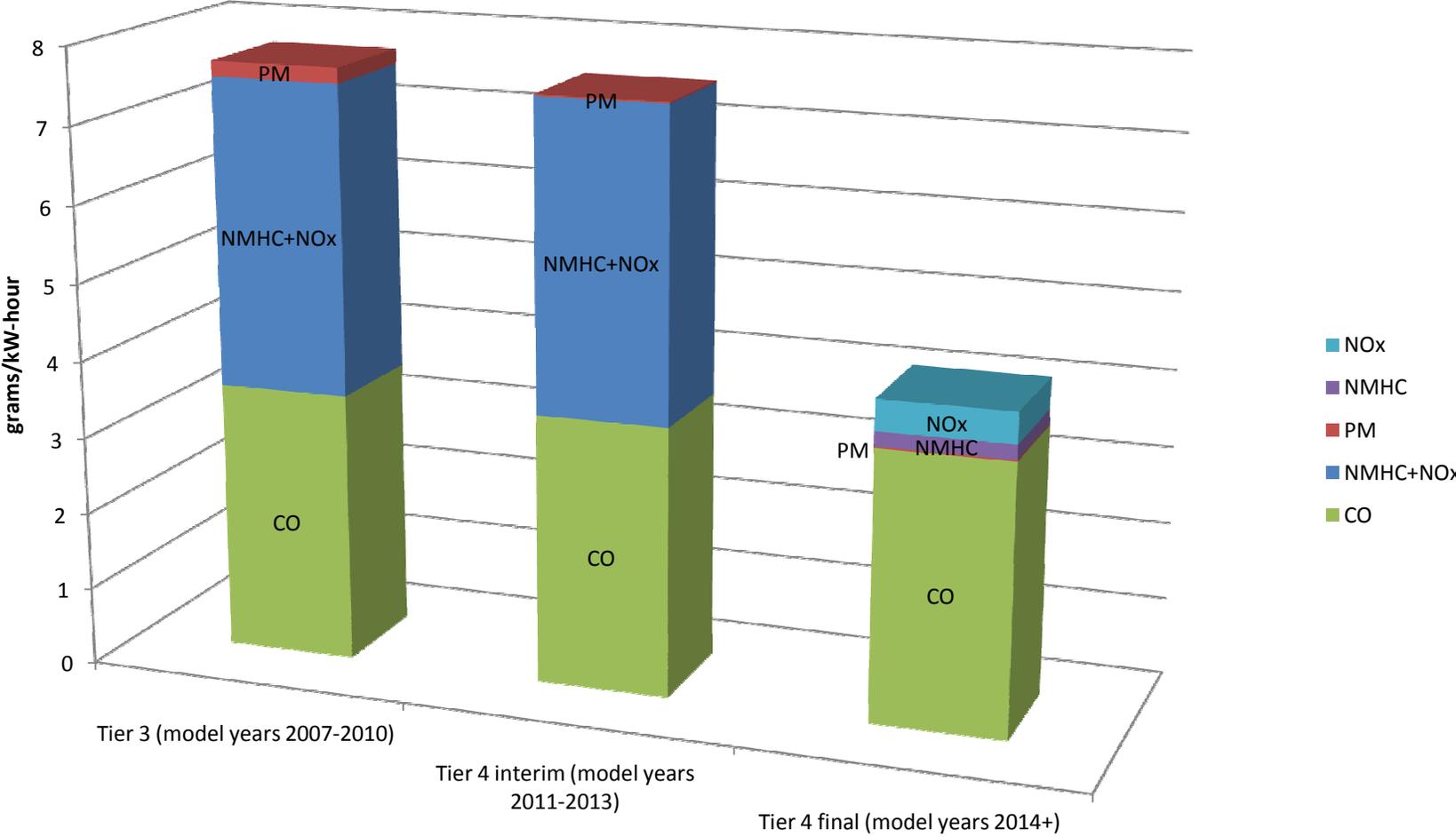
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- ▶ 2007 model year and later\*
  - ▶ Purchase certified engine
    - Emission standards generally equivalent to “Tier” standards for nonroad engines
  - ▶ Install, configure, operate and maintain engine per manufacturer’s instructions or manufacturer-approved procedures
    - Owner/operator performance testing not required
  - ▶ If operate differently than manufacturer’s recommendations, must do performance test to show compliance
  - ▶ Use ultra low sulfur diesel fuel

\*For CI fire pump engine, 2008-2011 model year and later (depending on engine size)

# Example: 300 kilowatt (kW) non-emergency engine

## Emission Standards for Engines with a Rated Power $225 \leq kW < 450$



# Monitoring/Recordkeeping/Reporting

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

# Stationary Spark Ignition Internal Combustion Engine NSPS

# SI ICE NSPS Applicability

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- ▶ Owners/operators of SI engines constructed (**ordered**) after June 12, 2006 **and**

Manufactured On/After	Engine Type
July 1, 2007	$\geq 500$ 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 (except emergency $> 25$ HP)
January 1, 2009	Emergency $> 25$ HP

- ▶ SI engines modified/reconstructed after June 12, 2006
- ▶ Engine manufacturers must certify stationary SI engines  $\leq 25$  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

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## ▶ 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; retest if engine is rebuilt or undergoes major repair or maintenance
  - $>500$  HP – initial performance test and subsequent every 8,760 hours or 3 years, whichever is first

# Compliance Requirements for Owners/Operators

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## ▶ Non-certified engines:

### ▶ Maintenance plan

### ▶ Performance testing

- $25 < \text{HP} \leq 500$  – initial test; retest if engine is rebuilt or undergoes major repair or maintenance
- $> 500$  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

# Contact Information

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Melanie King

Energy Strategies Group

Sector Policies and Programs Division

Office of Air Quality Planning and Standards

Office of Air and Radiation

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Email: [king.melanie@epa.gov](mailto: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 <sub>2</sub> 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 <sub>2</sub> O or 76% CH <sub>2</sub> 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 <sub>2</sub> O or 93% CO reduction			
>500	580 ppb CH <sub>2</sub> O or 70% CO reduction	12 ppm CH <sub>2</sub> O or 58% CO reduction		350 ppb CH <sub>2</sub> O or 76% CH <sub>2</sub> 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"><li>• CI <math>\geq</math>100 HP at major source</li><li>• SI 100-500 HP at major source</li></ul>	<ul style="list-style-type: none"><li>• Initial emission performance test</li><li>• Subsequent performance testing every 8,760 hours of operation or 3 years for engines &gt;500 HP (5 years if limited use)</li><li>• Operating limitations - catalyst pressure drop and inlet temperature for engines &gt;500 HP</li><li>• Notifications</li><li>• Semiannual compliance reports (annual if limited use)</li></ul> <p>Existing non-emergency CI &gt;300 HP:</p> <ul style="list-style-type: none"><li>• Ultra low sulfur diesel (ULSD)</li><li>• Crankcase emission control requirements</li></ul>

# Compliance Requirements: RICE at Major Sources

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

\*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

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

# EPA's Air Quality Rules for Reciprocating Internal Combustion Engines and their Application to Combined Heat and Power

Susan Lancey  
US EPA Region 1  
Boston, Massachusetts



# EPA's Air Quality Rules for Reciprocating Internal Combustion Engines and their Application to Combined Heat and Power

Questions?

# EPA's Air Quality Rules for Reciprocating Internal Combustion Engines and their Application to Combined Heat and Power

Roy Crystal  
US EPA Region 1  
Boston, Massachusetts



## Suggested Procedure for Complying with EPA RICE Requirements

- Step-by-step procedure - not required, suggested
- Many classes of RICE with different compliance requirements
- Develop an inventory that classifies all your RICE for key factors that determine applicable compliance requirements
- Use web tools & your inventory to determine requirements
- Take timely actions to meet requirements
- Call EPA or state if you get stuck

# Suggested Step-by-Step Procedure

- Step 1 - Determine if your RICE are Stationary
- Step 2 – Classify Each RICE by Key Factors
- Step 3 – Decide if Your RICE are Emergency or Non-Emergency
- Step 4 – Check if Your Emergency RICE are Subject to RICE NESHAP
- Step 5 – Determine if Your Source is Area or Major
- Step 6 – Determine if Your RICE are New or Existing
- Step 7 – Determine Compliance Requirements
- Step 8 – Review Compliance Dates & Address Any Noncompliance

# Key RICE Compliance Requirements for Facilities with CHP Units

- Notify, install controls, & complete testing for existing non-emergency RICE with emission limits – e.g., engines powering pumps or CHP prime movers (RICE NESHAP)
- Meet NSPS requirements for performance testing of recently or newly-purchased RICE – spark ignition gas or propane-fired units > 25 horsepower that are not certified by the manufacturer need to be tested (including prime movers for CHP units)
- Ensure emergency generators are not used more than “emergency” thresholds - 100 hrs/yr for total of maintenance, testing, and emergency demand response (EDR)
- Comply with NESHAP & NSPS requirements when you have a financial arrangement to operate your engine (e.g., peak shaving)

# Classify Each RICE by Key Factors

- Compression Ignition (CI) or Spark Ignition (SI)
- SI - 2 or 4-stroke, lean or rich burn, etc.
- Horsepower
- Date constructed/reconstructed
- Annual hours of use in emergency/non-emergency situations & for maintenance/testing
- Contract obligations and annual hours of use for financial arrangements to operate engine – e.g., emergency demand response, local system reliability, or peak shaving program

## Determine if Your Source is Area or Major

- Major – Facility-wide potential to emit  $\geq 10$  tons/year single Hazardous Air Pollutant (HAP) or  $\geq 25$  tons/year combined HAPs
- Area – not major (emit below Major limits)

# Determine Compliance Requirements

- NESHAP - existing non-emergency spark ignition 4-stroke RICE at area sources > 500 horsepower not in remote areas must install controls if engine used >24 hours/yr - oxidation catalyst if lean burn, Non-Selective Catalytic Reduction (NSCR) if rich burn
- Under the NSPS, Spark Ignition engines > 25 horsepower not certified by the manufacturer require performance tests
- Ensure emergency generators are not used more than “emergency” thresholds - 100 hrs/yr for total of maintenance, testing, and emergency demand response (EDR)
- Emergency engines only & no financial arrangements – straightforward

# Determine Compliance Requirements contd.

- Is it an emergency demand response, peak shaving (load management), or local reliability program? Read your contract!
- Requirements different for each type of financial arrangement
- Allowance for 50 hours for peak shaving or non-emergency demand response for emergency engines at area sources ended May 3, 2014 - allowed time for those continuing peak shaving to comply with non-emergency requirements
- State may have additional requirements; you must comply with both (check state regulatory agency air quality webpage)

# Information Sources on Your EPA Compliance Requirements

- Plain-language information on RICE NESHAP and NSPS Rules – Region 1 and National EPA RICE web pages (review presentations):

<http://www.epa.gov/region1/rice/>

<http://www.epa.gov/ttn/atw/icengines/>

- Regulation Navigation Tools for RICE NESHAP and NSPS –

<http://www.epa.gov/ttn/atw/icengines/comply.html>

- Electronic Code of Federal Regulations (E-CFR) is always current – link from national RICE webpage, “Basic Info” tab

<http://www.epa.gov/ttn/atw/icengines/> or <http://www.ecfr.gov>

# Review Compliance Dates & Address Any Noncompliance

- Engines with emission limits will often need to install controls and have notification requirements
- Submit overdue initial notifications ASAP - due 8/31/2010 for existing non-emergency CI RICE and 2/16/2011 for existing non-emergency SI RICE
- By RICE NESHAP compliance dates (5/3/13 CI, 10/19/13 SI) non-emergency engines must have controls installed & meet all other compliance requirements; stack test due 180 days after
- Secure funding if needed and take needed compliance actions
- Communicate with regulatory agency – EPA, delegated state or other regulatory agency

# Need More Help or Info?

Roy Crystal, Region 1 RICE Assistance Lead

[Crystal.roy@epa.gov](mailto:Crystal.roy@epa.gov), 617-918-1745

Susan Lancey, Region 1 Air Toxics Coordinator

(contact for RICE applicability determinations)

[Lancey.Susan@epa.gov](mailto:Lancey.Susan@epa.gov), 617-918-1656

Regional RICE Contacts

for other EPA regions – direct your questions to  
RICE contact for the region where the engine is -

<http://www.epa.gov/ttn/atw/icengines/imp.html> -

“Implementation Information” tab, “Regional Contacts” box

# EPA's Air Quality Rules for Reciprocating Internal Combustion Engines and their Application to Combined Heat and Power

Questions?

# Webinar Slides and Recording

- Slides from today's webinar presentations and the question and answer log will be available in PDF on the CHP website next week:  
<http://www.epa.gov/chp/events/webinars.html>.
- Today's webinar is being recorded. The recording will be available tomorrow morning at:  
<https://www2.gotomeeting.com/register/164471538>

# Contact Information

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