Yale University RICE MACT Compliance – Lessons Learned

Jim Romanski Presented to SIPRAC March 2017
Reciprocating Internal Combustion Engine
Maximum Achievable Compliance Technology
RICE Rules Brief Background

Actually Three Rules for RICE

• RICE MACT- 40 CFR part 63 subpart ZZZZ
  – Regulates Old and New Sources
  – Initially Applicable to Major Sources of HAPs
  – Area Source Rule pulls in All RICE sources.

• RICE NSPS - 40 CFR part 60 subpart IIII and JJJJ
  – Regulates “New” Sources (moving an engine does not make it a new source).
  – Applicable to Individual Units
  – Based on Installation Date
TWO 40 CFR Subparts but...

• RICE MACT and NSPS written to work together.
  – Compatible vs Combatabile
  – Covers a vast number of sources some that have never been regulated before.
  – Covers all RICE so there are many different categories.
  – No De Minimis size threshold for engine size.
RICE Rules Sources Covered

- **Reciprocating Internal Combustion Engines**
- Covers all types of stationary source engines
  - Electric Generators
  - Emergency Generators
  - Fire Pumps
  - Remote Location Power
  - Water Pumps
  - Diesel Chillers
  - Etc.
**Engine Types Regulated**

- **CI**: Compression Ignition (diesel)
- **SI**: Spark Ignition (gas including natural gas, landfill gas, gasoline, propane, etc.)
- **2SLB**: 2-stroke lean burn
- **4SLB**: 4-stroke lean burn
- **4SRB**: 4-stroke rich burn
- **4S**: 4-stroke
- **LFG/DG**: landfill gas/digester gas
- **ULSD**: Ultra Low Sulfur Diesel

**Notes:**
- 2-stroke: power cycle completed in 1 revolution of crankshaft
- 4-stroke: power cycle completed in 2 revolutions of crankshaft
- Lean burn: higher air/fuel ratio (fuel-lean)
- Rich burn: lower air/fuel ratio (fuel-rich)
Engine Categories Regulated

Based on:

• Size Cutoffs
• Existing Source
• New Source (Based on Installation Date)
• Located at a Major Source
• Located at a Minor Source
# Engine Categories

## RICE Rule Online Training

### Printable Module Slides and Audio Scripts

<table>
<thead>
<tr>
<th>Engine Type</th>
<th>Printable Materials</th>
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<tr>
<td><strong>Existing Engine at an Area Source</strong></td>
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</tr>
<tr>
<td>Introduction</td>
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<tr>
<td>Area source existing non-emergency spark ignition 4-stroke rich burn engine &lt;500 horsepower</td>
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<td>Area source existing non-emergency spark ignition engine &lt;500 horsepower, classified as residential, commercial, or institutional</td>
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<tr>
<td>Area source existing emergency engine &lt;500 horsepower</td>
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<td>Area source existing non-emergency compression ignition engine 300 &lt;500 horsepower</td>
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<tr>
<td>Area source existing non-emergency compression ignition engine &lt;500 horsepower</td>
<td>Module Slides Audio Script</td>
</tr>
<tr>
<td>Area source existing non-emergency landfill digester gas-fired engine &lt;500 horsepower</td>
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<td>Area source existing non-emergency spark ignition 2-stroke lean burn engine &lt;500 horsepower</td>
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<tr>
<td>Area source existing non-emergency spark ignition 2-stroke lean burn engine &lt;500 horsepower</td>
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<tr>
<td>Area source existing non-emergency spark ignition 4-stroke lean burn engine &lt;500 horsepower that operates more than 24 hours/year</td>
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<td>Area source existing non-emergency spark ignition 4-stroke lean burn engine &lt;500 horsepower</td>
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<td>Area source existing non-emergency spark ignition 4-stroke rich burn engine &lt;500 horsepower that operates more than 24 hours/year</td>
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<td><strong>Existing Engine at a Major Source</strong></td>
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<td>Introduction</td>
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<tr>
<td>Major source existing non-emergency compression ignition engine &lt;500 horsepower</td>
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<td>Major source existing non-emergency compression ignition engine &lt;500 horsepower</td>
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<tr>
<td>Major source existing non-emergency compression ignition engine &lt;500 horsepower</td>
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<td>Major source existing non-emergency compression ignition engine 100 &lt;500 horsepower</td>
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<td>Major source existing non-emergency compression ignition engine &lt;100 horsepower</td>
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<td>Major source existing non-emergency compression ignition engine &lt;500 horsepower</td>
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### Engine Categories cont.

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<td>2-stroke lean burn</td>
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<tr>
<td>4-stroke lean burn</td>
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<tr>
<td>4-stroke rich burn</td>
<td>500 horsepower</td>
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<tr>
<td>Gas-fired engine</td>
<td>500 horsepower</td>
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</tr>
<tr>
<td>Gas-fired engine</td>
<td>100 horsepower</td>
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### New Engine at a Major Source

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<td>Module Slides, Audio Script</td>
</tr>
<tr>
<td>4-stroke rich burn</td>
<td>Module Slides, Audio Script</td>
</tr>
<tr>
<td>Gas-fired engine</td>
<td>Module Slides, Audio Script</td>
</tr>
<tr>
<td>Gas-fired engine</td>
<td>Module Slides, Audio Script</td>
</tr>
<tr>
<td>500 horsepower</td>
<td>Module Slides, Audio Script</td>
</tr>
<tr>
<td>100 horsepower</td>
<td>Module Slides, Audio Script</td>
</tr>
<tr>
<td>New engine type</td>
<td>Module Slides, Audio Script</td>
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</tbody>
</table>
RICE MACT

• Continued Rule Making and Lawsuits made RICE MACT a moving target.
• “Final” Rule(s) are complicated.
  – Possibly hastened Tom Scelfo’s retirement?
• Still waiting for EPA to “fix” the Demand Response situation.
RICE MACT Demand Response Issue

- Emergency Engines Originally Allowed to Operate for Demand Response and Continue to be considered “Emergency Engines”
  - Started out allowing for 50 hours of Demand Response
  - Was reduced to 15 hours of Demand Response
    - Delaware objected to any Demand Response hours
  - Courts throughout parts of rule allowing “Emergency Engines” to run for Demand Response
    - Many sources did not sign up for Demand Response Programs last year.
  - EPA has promised to change the rule in reply to the court ruling to allow for some Demand Response
    - Sources still waiting for EPA to do rule making. Not likely to happen for this years high electric demand season.
Rule Complexity?

Area Source SI RICE Requirements – Final Revision contd.

- Remote stationary RICE defined as:
  - Located in an 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.), 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
Stationary Reciprocating Internal Combustion Engines (RICE)
40 CFR part 63, subpart ZZZZ
Applicability Flowchart

START

Is your engine being tested at a stationary RICE test cell/stand?\(^a\)

- YES
- NO

- NO

Do you own or operate a stationary engine?

- NO

You are not subject to 40 CFR part 63, subpart ZZZZ

- YES

Does your facility have the potential to emit 10 or more tons/year of any single hazardous air pollutant or 25 or more tons/year of any combination of hazardous air pollutants?\(^b\)

- YES

You have a major source
GO TO STEP 2 of this flowchart

- NO

You have an area source

- NO

Did you begin construction or reconstruction on your stationary engine before June 12, 2006?

- YES

You have an existing area source
GO TO STEP 1a of RICE Summary Table\(^c\)

- NO

You have a new or reconstructed area source
GO TO STEP 1b of RICE Summary Table\(^c\)

\(^a\)An engine test cell/stand is any apparatus used for testing uninstalled stationary or uninstalled mobile (motive) engines.

\(^b\)For assistance in determining the potential to emit, please refer to [http://www.epa.gov/ttn/chief/ap42/index.html](http://www.epa.gov/ttn/chief/ap42/index.html) or contact your EPA regional office or state permitting staff.

July 2010
Stationary Reciprocating Internal Combustion Engines (RICE)
40 CFR part 63, subpart ZZZZ
Applicability Flowchart

STEP 2

Did you begin construction or reconstruction on your stationary engine before June 12, 2006?

NO

Did you begin construction or reconstruction on your stationary engine before December 19, 2002?

YES

NO

Does your major source have a stationary engine above 500 HP?

YES

NO

You have an existing stationary engine above 500 HP at a major source
GO TO STEP 2(a)(ii) of RICE Summary Tablec

You have a new or reconstructed stationary engine above 500 HP at a major source
GO TO STEP 2(b)(ii) of RICE Summary Tablec

YES

You have an existing stationary engine of 500 HP or less at a major source
GO TO STEP 2(a)(i) of RICE Summary Tablec

You have a new or reconstructed stationary engine of 500 HP or less at a major source
GO TO STEP 2(b)(i) of RICE Summary Tablec

You have an existing stationary engine above 500 HP at a major source
GO TO STEP 2(a)(ii) of RICE Summary Tablec

You have a new or reconstructed stationary engine above 500 HP at a major source
GO TO STEP 2(b)(ii) of RICE Summary Tablec

cThe RICE Summary Table of Requirements provides additional information on 40 CFR part 63, subpart ZZZZ requirements and is available at http://www.epa.gov/ttn/atw/rice/ricepg.html.

July 2010
Region 1: EPA New England

Reciprocating Internal Combustion Engines (RICE)

What Are Reciprocating Internal Combustion Engines or RICE?

RICE use pistons that alternatively move back and forth to convert pressure into rotating motion. They're commonly used at power and manufacturing plants to generate electricity and to power pumps and compressors. RICE are also used in emergencies to produce electricity and pump water for flood and fire control. The U.S. Environmental Protection Agency (EPA) has recently finalized new air quality regulations that place requirements on owners and operators of a wide variety of stationary RICE.

Why Does EPA Regulate RICE?

RICE are common combustion sources that collectively can have a significant impact on air quality and public health. The
Controlling Air Pollution from Stationary Engines

Basic Information

- What are stationary engines?
- Why does EPA regulate stationary engines?
- How does EPA regulate stationary engines?
- Which type of stationary engines does EPA regulate?

Regulatory Actions

- Which regulations apply to stationary engines?
  - NESHAP for Reciprocating Internal Combustion Engines
  - NSPS for Compression Ignition Internal Combustion Engines
  - NSPS for Spark Ignition Internal Combustion Engines

Compliance Requirements

- What requirements apply to stationary engines?

Tools to Help You Comply

- What guidance and tools exist for implementing stationary engine rules?
Guidance and Tools for Implementing Stationary Engine Requirements

Below are tools and guidance documents to help you comply with the stationary engines rules.

- National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines
  - Regulation Navigation Tool
  - Example Forms
  - Summary Tables
  - Webinars and Presentations
  - Videos
  - Other Guidance Documents

- New Source Performance Standards for Stationary Compression Ignition Internal Combustion Engines
  - Regulation Navigation Tool
  - Example Forms
  - Summary Tables
  - Videos
  - Other Guidance Documents

- New Source Performance Standards for Stationary Spark Ignition Internal Combustion Engines
  - Regulation Navigation Tool
  - Example Forms
  - Summary Tables
  - Videos
  - Other Guidance Documents

Contact Us to ask a question, provide feedback, or report a problem.
CT DEEP Support Tools

CT DEEP Support Tools

April 9, 2015

Agenda

Update on EPA Rule Making

May 14, 2015

Agenda

Proposed Good Neighbor Ozone SIP

Proposed 2015 Air Monitoring Network Plan

Overview of Boiler and RICE Modules On-line Training

June 11, 2015

Agenda

July 9, 2015

NOTE: July meeting is cancelled

August 13, 2015

Agenda

200y Ozone Bump-Up

GPLPE Notice Tentative Determination

GPLPE Overview Presentation

GPLPE Proposed Tentative Determination

Hydrogen Refueling Infrastructure Grants

Preliminary Ozone Season Forecasting Summary

RCRA Section 22 Updates

Jun 13, 1989 EPA Guidance on Limiting Potential to Emit (PTE)

August 27, 1996 EPA Transition Policy and Extensions:

Extension 1
Area Source Boiler Rule and RICE NESHAP
Online Training Modules

May 14, 2015
Kaitlin Stern

Connecticut Department of Energy and Environmental Protection
Air Compliance Assurance Training & Education

DEEP's Air Bureau is dedicated to providing easy access to air compliance workshops, educational webinars, presentations, guidance materials, and fact sheets. This information is intended to train and educate regulated industries, businesses, and municipalities about compliance with air quality permits and regulations. This training and educational webpage will be updated as new information and training opportunities become available.

Guidance Materials | Presentations | Training Modules | Webinars | Workshops

### Guidance Materials

<table>
<thead>
<tr>
<th>Title</th>
<th>Description</th>
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<td>...</td>
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Presentations

<table>
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<th>Description</th>
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</table>
Yale Strategy for Compliance

• Inventory

• Categorization

• Regulatory analysis

• Install Monitoring Equipment if Necessary
Initial List of Engines

• Listed in Title V or Title V applications
  – ~12 at Med School Campus
  – ~7 at Central Science campus

• Listed in GPLPE at West Campus
  – ~6 Engines

• Some with NSR Permits the rest Regulated under 3b
The List Grows

- Several Engines at Non-Contiguous Properties in New Haven added to the list

- Started to find out about properties outside of New Haven

- The List Grew from ~25 Engines to 54 Engines spread out all over the place.
After Finalizing the Inventory

- Obtain technical information about engines
- Find out their installation dates
- Classify them by type
- Do a regulatory analysis
- Find out who manages them
  - Initially was just the Powerplants and a few Mechanics
- Obtain current records if any (for engines that didn’t previously require records).
### Eligibility:

**Existing Emergency Compression Ignition Engines <= 500 hp**

<table>
<thead>
<tr>
<th>Area</th>
<th>Yale Emis</th>
<th>Title V</th>
<th>Make</th>
<th>Model #</th>
<th>Fuel:</th>
<th>kW</th>
<th>Est. hp</th>
<th>Install Date</th>
<th>Demand Response?</th>
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</thead>
<tbody>
<tr>
<td>GS300</td>
<td>MSG009</td>
<td>Main St. Detroit Diesel</td>
<td>63TK35 Spec A 3+</td>
<td>Diesel</td>
<td>150</td>
<td>201</td>
<td>5/30/2003</td>
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<td>GS300</td>
<td>MSG019</td>
<td>2 Main St. Detroit Diesel</td>
<td>350DSE</td>
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<td>355</td>
<td>476</td>
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<td>MS</td>
<td>MSG013</td>
<td>3 Main St. Mitsubishi</td>
<td>6D2-4-T</td>
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<td>150</td>
<td>201</td>
<td>4/24/2001</td>
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<td>4 Main St. Whisperdell</td>
<td>DF-2400V</td>
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<td>225</td>
<td>302</td>
<td>7/1/1996</td>
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<td>NC</td>
<td>NCG011</td>
<td>5 Main St. Kohler</td>
<td>800/S0AO2Z81</td>
<td>Diesel</td>
<td>55</td>
<td>81</td>
<td>5/1/2000</td>
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**Existing Emergency Compression Ignition Engines > 500 hp**

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<tr>
<th>Area</th>
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<th>Title V</th>
<th>Make</th>
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<tr>
<td>MS</td>
<td>MSG001</td>
<td>S-16</td>
<td>Caterpillar</td>
<td>3412</td>
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<td>MSG002</td>
<td>S-17</td>
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<td>WCG003</td>
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**Existing Emergency Spark Ignition Engines <= 500 hp**

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<tr>
<td>AF</td>
<td>NCG001</td>
<td>20 Main St. Kohler</td>
<td>30R7/272</td>
<td>Natural Gas</td>
<td>30</td>
<td>40</td>
<td>1/1/1993</td>
<td>No</td>
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<td>AF</td>
<td>NCG005</td>
<td>29 Main St. Caterpillar</td>
<td>GY25F1</td>
<td>Propane</td>
<td>22.6</td>
<td>30</td>
<td>12/12/1999</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>NC</td>
<td>NCG014</td>
<td>30 Main St. Cummins</td>
<td>DFCB-5627949</td>
<td>Natural Gas</td>
<td>300</td>
<td>450</td>
<td>8/5/2003</td>
<td>No</td>
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<tr>
<td>NC</td>
<td>NCG015</td>
<td>31 Main St. Kohler</td>
<td>50RE02J</td>
<td>Diesel</td>
<td>55</td>
<td>83</td>
<td>8/1/2005</td>
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<tr>
<td>SC</td>
<td>SCG002</td>
<td>32 Main St. Kohler</td>
<td>15MY77</td>
<td>Diesel</td>
<td>15</td>
<td>20</td>
<td>1/1/1983</td>
<td>No</td>
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<tr>
<td>SC</td>
<td>SCG003</td>
<td>33 Main St. Kohler</td>
<td>10RZB2</td>
<td>Natural Gas</td>
<td>10</td>
<td>13</td>
<td>6/7/1985</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>
### Fuel Requirements

- Diesel fuel must meet requirements in 40 CFR § 63.6604(d).
- Diesel fuel must meet requirements in 40 CFR § 63.6604(e)(3).
- An oil analysis program may be followed in lieu of scheduled oil change specified in Table 2d. The oil analysis must be performed at the same frequency specified for changing the oil and must account for the oil's Total Base Number, viscosity, and percent water content. The condemning limits for these parameters are:
  - Total Base Number is less than 30 percent of the oil's Total Base Number when new.
  - Viscosity of the oil has changed by more than 20 percent from the viscosity of the oil when new.
  - Percent water content (by volume) is greater than 0.5.
- If any of the limits are exceeded, the oil should be changed within 2 days of receiving the results of the analysis or before commencing operation, whichever is later. Keep records of the parameters that are monitored as part of the analysis, the results of the analysis, and the engine changes that are made as part of the maintenance program.

### Monitoring, Installation, Operation & Maintenance Requirements

- Operate and maintain in the stationary RICE according to the manufacturer's written instructions or your own maintenance plan to maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions.
- Install a non-resettable hour meter.
- Minimize the engine's time spent at idle and the time spent at startup to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes.
- An oil analysis program may be followed in lieu of scheduled oil change specified in Table 2d. The oil analysis must be performed at the same frequency specified for changing the oil and must account for the oil's Total Base Number, viscosity, and percent water content. The condemning limits for these parameters are:
  - Total Base Number is less than 30 percent of the oil's Total Base Number when new.
  - Viscosity of the oil has changed by more than 20 percent from the viscosity of the oil when new.
  - Percent water content (by volume) is greater than 0.5.
- If any of the limits are exceeded, the oil should be changed within 2 days of receiving the results of the analysis or before commencing operation, whichever is later. Keep records of the parameters that are monitored as part of the analysis, the results of the analysis, and the engine changes that are made as part of the maintenance program.

### Continuous Compliance

At all times you must operate and maintain any affected source in a manner consistent with safety and good air pollution control practices for minimizing emissions.

You must report each instance in which you did not meet the requirements in Table 8 (General Provisions) that apply to you. There is no time limit on the use of emergency stationary RICE in emergency situations. Operation for the purpose of maintenance and testing or demand response (for now) is limited to 100 hours per year.

### Compliance Date

5/3/2013
New Compression Ignition Emergency Engines Subject to 40 CFR Part 60 Subpart III

**RICE MACT Applicability**

40 CFR § 63.6590(d)

A new stationary RICE located at an area source of HAPs must meet the requirements of the RICE MACT by meeting the requirements of 40 CFR Part 60 Subpart III, for compression ignition engines or 40 CFR Part 60 Subpart J, for spark ignition engines. No further RICE MACT requirements apply for such engines.

**NSPS Applicability**

40 CFR § 60.4204(b)

An engine is subject to the emissions standards of this section if it is manufactured after April 1, 2006, and is not fire pump engines.

**Emissions Standards**

40 CFR § 60.4205(b)

**For the purposes of NSPS Subpart III, the date that construction commences is the date the engine is ordered by the owner or operator.**

**Fuel Requirements**

40 CFR § 60.4207(b)

Purchase diesel fuel that meets the requirements of 40 CFR §§ 80.15(b) for nonroad diesel fuel - i.e., maximum sulfur content of 15 ppm; and either a minimum cetane index of 40, or a maximum aromatic content of 35% by volume.

**Importing/Installing Requirements**

40 CFR § 60.4208(a)

**After December 31, 2008, owners and operators may not install stationary CI ICE (excluding fire pump engines) that do not meet the applicable requirements for 2007 model year engines.**

40 CFR § 60.4208(b)

**After December 31, 2009, owners and operators may not install stationary CI ICE with a maximum engine power of less than 19 KW (25 HP) (excluding fire pump engines) that do not meet the applicable requirements for 2008 model year engines.**

40 CFR § 60.4208(c)

The requirements of this section do not apply to owners or operators of stationary CI ICE that have been modified, reconstructed, and do not apply to engines that were removed from one existing location and reinstalled at a new location.

### Table: Area Source of HAPs

<table>
<thead>
<tr>
<th>Area</th>
<th>Yale Emiss. Unit #</th>
<th>Title V EU#</th>
<th>Location Descr.</th>
<th>Make</th>
<th>Model #</th>
<th>Fuel</th>
<th>kW</th>
<th>Est. hp</th>
<th>Install Date</th>
<th>Model Year</th>
<th>Engine Demand Response?</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS</td>
<td>MSG018</td>
<td>S-46</td>
<td>1 Elm Street</td>
<td>Caterpillar/HO</td>
<td>Eng.: 3412B, Gen...5R</td>
<td>Diesel</td>
<td>750</td>
<td>1006</td>
<td>10/1/2006</td>
<td>2006</td>
<td>No</td>
</tr>
<tr>
<td>NC</td>
<td>NC002</td>
<td>2 E Elm Street</td>
<td>Cummins</td>
<td>800DCG</td>
<td>Diesel</td>
<td>80</td>
<td>107</td>
<td>3/1/2007</td>
<td>2006</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>NC</td>
<td>NC003</td>
<td>3 E Elm Street</td>
<td>Cummins</td>
<td>DSFAE-92707</td>
<td>Diesel</td>
<td>80</td>
<td>107</td>
<td>11/21/2009</td>
<td>2009</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>CPG004</td>
<td>4 Elm Street</td>
<td>Caterpillar</td>
<td>3516B</td>
<td>Diesel</td>
<td>2000</td>
<td>2682</td>
<td>1/1/2007</td>
<td>2001</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>CPG005</td>
<td>C-197</td>
<td>5 Elm Street</td>
<td>Caterpillar</td>
<td>3516C</td>
<td>#2 Fuel</td>
<td>2000</td>
<td>2682</td>
<td>5/1/2012</td>
<td>2010</td>
<td>No</td>
</tr>
<tr>
<td>SC</td>
<td>SCG012</td>
<td>C-201</td>
<td>6 Elm Street</td>
<td>Cummins</td>
<td>QXS15-G9</td>
<td>Diesel</td>
<td>500</td>
<td>670</td>
<td>5/5/2010</td>
<td>2009</td>
<td>No</td>
</tr>
<tr>
<td>SC</td>
<td>SCG013</td>
<td>C-202</td>
<td>7 Elm Street</td>
<td>Cummins</td>
<td>DGFC-S80102</td>
<td>Diesel</td>
<td>200</td>
<td>268</td>
<td>5/12/2007</td>
<td>2006</td>
<td>No</td>
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<tr>
<td>NC</td>
<td>NC015</td>
<td>E Elm Street</td>
<td>Caterpillar</td>
<td>3516</td>
<td>Diesel</td>
<td>2000</td>
<td>2682</td>
<td>1/7/2013</td>
<td>2009</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>NC</td>
<td>NC016</td>
<td>9 Elm Street</td>
<td>Caterpillar</td>
<td>3516</td>
<td>Diesel</td>
<td>2000</td>
<td>2682</td>
<td>1/7/2013</td>
<td>2009</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>WC</td>
<td>WCG007</td>
<td>10 Elm Street</td>
<td>Kohler</td>
<td>15REO2JF</td>
<td>Diesel</td>
<td>150</td>
<td>222</td>
<td>6/17/2015</td>
<td>2015</td>
<td>No</td>
<td></td>
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<tr>
<td>SC</td>
<td>SCG007</td>
<td>11 Elm Street</td>
<td>Cummins</td>
<td>QSL9-G2 NR3</td>
<td>Diesel</td>
<td>230</td>
<td>3018</td>
<td>1/16/2015</td>
<td>2014</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>SCG018</td>
<td>12 Elm Street</td>
<td>Kohler/ John Deere</td>
<td>250REO2JE</td>
<td>Diesel</td>
<td>255</td>
<td>385</td>
<td>3/30/2016</td>
<td>2016</td>
<td>No</td>
<td></td>
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</table>
**New Spark Ignition Emergency Engines Subject to 40 CFR Part 60 Subpart JJJJ**

<table>
<thead>
<tr>
<th>Site Status:</th>
<th>Area Source of HAPs</th>
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</thead>
<tbody>
<tr>
<td>Engine Type:</td>
<td>Spark Ignition</td>
</tr>
<tr>
<td>New/Existing:</td>
<td>New (Installed post 6/12/2006)</td>
</tr>
<tr>
<td>Operating Category:</td>
<td>Emergency</td>
</tr>
<tr>
<td>Demand Response:</td>
<td>No demand response operation</td>
</tr>
<tr>
<td>Size Category:</td>
<td>=&gt;130 hp &lt;500</td>
</tr>
</tbody>
</table>

**RICE MACT Applicability**

- A new stationary RICE located at an area source of HAP must meet the requirements of the RICE MACT by meeting the requirements of 40 CFR Part 60 Subpart JJJJ, for compression ignition engines or 40 CFR Part 60 Subpart JJJJ, for spark ignition engines.

- No further RICE MACT requirements apply for such engines.

**NSPS Applicability**

- NSPS Subpart JJJJ applies to owners and operators of stationary SI ICE that commence construction after June 12, 2006, where the stationary SI ICE are manufactured on or after January 1, 2009, for emergency engines with a maximum engine power greater than or equal to 130 KW (25 HP).

**Emissions Standard**

- In units of ppmvd @15% Oxygen: NOx: 160; CO: 540; VOC: 86

**Importing / Installing Requirements**

- Emergency stationary ICE with a maximum engine power greater than or equal to 130 HP (and manufactured on or after 1/1/2009) are subject to the following limits:

**General Compliance Requirements**

- Owners and operators of stationary SI ICE must operate and maintain stationary SI ICE that achieve the emission standards as required in 40 CFR §60.4233 over the entire life of the engine.

**Monitoring Requirements**

- Install a non-resettable hour meter (or meet requirements for non-emergency engines).  
- NOTE for any emergency stationary SI ICE that is greater than or equal to 130 HP and less than 500 HP, this requirement only applies to an engine built on or after January 1, 2011.

<table>
<thead>
<tr>
<th>Area</th>
<th>Yale Emis</th>
<th>Title V EU#</th>
<th>Location Descr</th>
<th>Make</th>
<th>Model #</th>
<th>Fuel</th>
<th>kW</th>
<th>Est. hp</th>
<th>Install Date</th>
<th>Engine Model Year</th>
<th>Demand Response</th>
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<tbody>
<tr>
<td>GS300</td>
<td>MSG020</td>
<td>Off-Site 1</td>
<td>GS300 MSG020 Cummins GGBL-579-1434 Natural Gas 150 201 6/1/2007 2007 No</td>
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<tr>
<td>GS300</td>
<td>MSG024</td>
<td>Off-Site 2</td>
<td>GS300 MSG024 Onan GGBL-B4666 Natural Gas 150 225 9/10/2010 2010 No</td>
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<tr>
<td>GS300</td>
<td>MSG026</td>
<td>Off-Site 3</td>
<td>GS300 MSG026 Cummins GGHH115067 Natural Gas 100 150 6/16/2010 2010 No</td>
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<tr>
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<td>NCG007</td>
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<tr>
<td>NC</td>
<td>NCG008</td>
<td>Off-Site 5</td>
<td>NC NCG008 Cummins GGBL-B7234167 Natural Gas 187 281 9/4/2008 2008 No</td>
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<tr>
<td>NC</td>
<td>NCG012</td>
<td>Off-Site 6</td>
<td>NC NCG012 Cummins GGHH1208681 Natural Gas 100 150 9/1/2009 2009 No</td>
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<tr>
<td>NC</td>
<td>OCG13</td>
<td>Off-Site 7</td>
<td>NC OCG13 Olypmian G1501G Natural Gas 150 225 9/1/2009 2009 No</td>
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<tr>
<td>GS300</td>
<td>MSG025</td>
<td>Off-Site 8</td>
<td>GS300 MSG025 Onan GGHB5768294 Natural Gas 85 128 7/18/2006 2006 No</td>
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<tr>
<td>SC</td>
<td>SCG017</td>
<td>Off-Site 9</td>
<td>SC SCG017 Kohler 80REZGD Natural Gas 80 122 3/22/2016 2016 No</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Recordkeeping Requirements**

- General Reporting, Notification, and Recordkeeping:

- Owners and operators of stationary SI ICE must meet the applicable requirements in §60.4233 after January 1, 2011.

- Owners and operators of stationary SI ICE must operate and maintain stationary SI ICE that achieve the emission standards as required in 40 CFR parts 90, 1048, 1054, and 1060, as applicable.

- Maintenance conducted on the engine.

- Owners and operators of all stationary SI ICE must keep records of the following information:

- Owners and operators of all stationary SI ICE must keep records of any notification any notification.

- Maintenance conducted on the engine.

- If the stationary SI internal combustion engine is not a certified engine or is a certified engine operating in a non-certified manner and subject to 40 CFR §60.4245(a)(2), documentation that the engine meets the emission standards.

- For all stationary SI emergency ICE greater than or equal to 130 HP and less than 500 HP manufactured on or after July 1, 2011, that do not meet the standards applicable to non-emergency engines, the owner or operator of such engines must keep records of the hours of operation of the engine that is recorded through the non-resettable hour meter. The owner or operator must document how many hours are spent for emergency operation, including what classified the operation as emergency and how many hours are spent for non-emergency operation.

**Demand Response Operation**

- Owners and operators of stationary SI ICE have the option of operating under Demand Response operation for a maximum of 100 hours per calendar year.

- There is no limit on the use of emergency stationary ICE in emergency situations.
Non-Emergency, Compression Ignition Engines Subject to RICE MACT

<table>
<thead>
<tr>
<th>Site Status</th>
<th>Area Source of HAPs</th>
<th>Engine Type</th>
<th>New/Existing Category</th>
<th>Operating Category</th>
<th>Demand Response</th>
<th>Size Category</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Compression Ignition</td>
<td>Existing (Installed pre 6/12/2006)</td>
<td>Non-Emergency</td>
<td>Yes (but doesn't affect requirements)</td>
<td>&gt; 500 hp</td>
</tr>
</tbody>
</table>

### Fuel Requirements

#### 40 CFR § 63.6625(b):
- Conduct any initial performance test according to Tables 4 and 5 within 180 days after the compliance date.
- Either a minimum cetane index of 40, OR a maximum aromatic content of 35% by volume.
- Maximum sulfur content of 15 ppm; and

#### 40 CFR § 63.6604(a):
- Maintain catalyst so that the pressure drop across the catalyst does not change by more than 2 inches of water from the pressure drop across the catalyst that was measured during the initial performance test.
- Maintain the temperature of your stationary RICE exhaust so that the catalyst inlet temperature is greater than or equal to 450 °F and less than or equal to 1350 °F. [Sources can petition the Administrator for a different temperature range]

### Performance Tests

#### 40 CFR § 63.6620:
- Conduct subsequent performance tests every 8,760 hours or 3 years, whichever comes first.
- The test must be conducted at any load condition within plus or minus 10 percent of 100 percent load for the stationary RICE.
- You must conduct three separate test runs for each performance test.
- Each test run must last at least 1 hour, unless otherwise specified in this subpart.
- The engine percent load during a performance test must be determined by documenting the calculations, assumptions, and measurement devices used to measure or estimate the percent load in a specific application. A written report of the average percent load determination must be included in the notification of compliance status.

#### 40 CFR § 63.6620(a):
- Conduct any initial performance test according to Tables 4 and 5 within 180 days after the compliance date.

### Continuous Compliance

### Monitoring, Installation, Operation & Maintenance Requirements

#### 40 CFR § 63.6625(b):
- Prepare a site-specific monitoring plan that addresses the monitoring system design, data collection, and the quality assurance and quality control elements outlined in 40 CFR §63.6625(b)(1)(i) through (v) (Table 3).
- Operate and maintain open or closed crankcase ventilation system in accordance with manufacturer's specified maintenance requirements.
- Minimize the engine's time spent at idle during startup and minimize the engine's startup time to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes, after which time the emission standards applicable to all times other than startup in Tables 1a, 2a, 2c, and 2d apply.

### Complying Subpart

#### 40 CFR § 63.6625(g):
- Compliance with the numerical emission limitations established in this subpart is based on the results of testing the average of three 1-hour runs using the testing requirements and procedures in §63.6620 and Table 4.
- Comply with the requirements in Table 2d to this subpart that apply

#### Table 2d:
- Limit concentration of CO in the stationary RICE exhaust to 23 ppmvd at 15 percent O2; or

#### Table 4:
- Conduct subsequent performance tests every 8,760 hours or 3 years, whichever comes first.
- The test must be conducted at any load condition within plus or minus 10 percent of 100 percent load for the stationary RICE.

#### Table 3:
- Conduct any initial performance test according to Tables 4 and 5 within 180 days after the compliance date.
- Either a minimum cetane index of 40, OR a maximum aromatic content of 35% by volume.
- Maximum sulfur content of 15 ppm; and

#### Table 5:
- Conduct any initial performance test according to Tables 4 and 5 within 180 days after the compliance date.
- Either a minimum cetane index of 40, OR a maximum aromatic content of 35% by volume.
- Maximum sulfur content of 15 ppm; and

#### Table 6:
- Conduct performance tests every 3 years or 8,760 hours, whichever comes first.
- Operate and maintain the engine, including associated air pollution control equipment and monitoring equipment, in a manner consistent with safety and good air pollution control practices for minimizing emissions.

#### Table 7:
- Conduct performance tests every 3 years or 8,760 hours, whichever comes first.
- Operate and maintain the engine, including associated air pollution control equipment and monitoring equipment, in a manner consistent with safety and good air pollution control practices for minimizing emissions.

#### Table 8:
- Submit semi-annual reports (in accordance with semi-annual reporting schedule in Title V permit) that identify any deviations, periods where CPMS was out-of-control, or any malfunctions.
- Records of performance tests and performance evaluations.
- Records of actions taken during periods of malfunction to minimize emissions, including corrective actions to restore malfunctioning process and air pollution control and monitoring equipment to its normal or usual manner of operation.

#### Table 9:
- Submit semi-annual reports (in accordance with semi-annual reporting schedule in Title V permit) that identify any deviations, periods where CPMS was out-of-control, or any malfunctions.
- Records of performance tests and performance evaluations.
- Records of actions taken during periods of malfunction to minimize emissions, including corrective actions to restore malfunctioning process and air pollution control and monitoring equipment to its normal or usual manner of operation.

#### Table 10:
- Submit semi-annual reports (in accordance with semi-annual reporting schedule in Title V permit) that identify any deviations, periods where CPMS was out-of-control, or any malfunctions.
- Records of performance tests and performance evaluations.
- Records of actions taken during periods of malfunction to minimize emissions, including corrective actions to restore malfunctioning process and air pollution control and monitoring equipment to its normal or usual manner of operation.

#### Table 11:
- Submit semi-annual reports (in accordance with semi-annual reporting schedule in Title V permit) that identify any deviations, periods where CPMS was out-of-control, or any malfunctions.
- Records of performance tests and performance evaluations.
- Records of actions taken during periods of malfunction to minimize emissions, including corrective actions to restore malfunctioning process and air pollution control and monitoring equipment to its normal or usual manner of operation.

#### Table 12:
- Submit semi-annual reports (in accordance with semi-annual reporting schedule in Title V permit) that identify any deviations, periods where CPMS was out-of-control, or any malfunctions.
- Records of performance tests and performance evaluations.
- Records of actions taken during periods of malfunction to minimize emissions, including corrective actions to restore malfunctioning process and air pollution control and monitoring equipment to its normal or usual manner of operation.

#### Table 13:
- Submit semi-annual reports (in accordance with semi-annual reporting schedule in Title V permit) that identify any deviations, periods where CPMS was out-of-control, or any malfunctions.
- Records of performance tests and performance evaluations.
- Records of actions taken during periods of malfunction to minimize emissions, including corrective actions to restore malfunctioning process and air pollution control and monitoring equipment to its normal or usual manner of operation.

#### Table 14:
- Submit semi-annual reports (in accordance with semi-annual reporting schedule in Title V permit) that identify any deviations, periods where CPMS was out-of-control, or any malfunctions.
- Records of performance tests and performance evaluations.
- Records of actions taken during periods of malfunction to minimize emissions, including corrective actions to restore malfunctioning process and air pollution control and monitoring equipment to its normal or usual manner of operation.

#### Table 15:
- Submit semi-annual reports (in accordance with semi-annual reporting schedule in Title V permit) that identify any deviations, periods where CPMS was out-of-control, or any malfunctions.
- Records of performance tests and performance evaluations.
- Records of actions taken during periods of malfunction to minimize emissions, including corrective actions to restore malfunctioning process and air pollution control and monitoring equipment to its normal or usual manner of operation.

#### Table 16:
- Submit semi-annual reports (in accordance with semi-annual reporting schedule in Title V permit) that identify any deviations, periods where CPMS was out-of-control, or any malfunctions.
- Records of performance tests and performance evaluations.
- Records of actions taken during periods of malfunction to minimize emissions, including corrective actions to restore malfunctioning process and air pollution control and monitoring equipment to its normal or usual manner of operation.
## Non-Emergency, Spark Ignition Engines Subject to RICE MACT

**Site Status:** Area Source of HAPs  
**Engine Type:** Spark Ignition  
**New/Existing:** Existing (Installed pre 6/12/2006)  
**Operating Category:** Non-Emergency

### Table: Engines Subject to RICE MACT

<table>
<thead>
<tr>
<th>Area</th>
<th>Yale Emis</th>
<th>Unit #</th>
<th>Location Descr</th>
<th>Make</th>
<th>Model #</th>
<th>Fuel</th>
<th>kW</th>
<th>Est. hp</th>
<th>Install Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC</td>
<td>NCG009</td>
<td></td>
<td>Off-Site A</td>
<td>Kohler</td>
<td>20RZ</td>
<td>Propane</td>
<td>20</td>
<td>30</td>
<td>1/1/2001</td>
</tr>
<tr>
<td>NC</td>
<td>NCG010</td>
<td></td>
<td>Off-Site B</td>
<td>Winco</td>
<td>CSAPSS8000-N</td>
<td>Propane</td>
<td>8</td>
<td>12</td>
<td>1/1/2003</td>
</tr>
</tbody>
</table>

**Compliance Date:** 10/19/2013

**Limitations / Work Practices**

- **40 CFR § 63.6603(a):** Comply with the operating limitations in Table 2d to this subpart that apply
- **Table 2d:**
  - Change the oil every 1,440 hours of operation or annually, whichever comes first (or analyze the oil per 63.6625(j))
  - Inspect the spark plugs every 1,440 hours of operation or annually, whichever comes first, replace as necessary
  - Inspect all hoses and belts every 1,440 hours of operation or annually, whichever comes first, replace as necessary

**Note for 2-stroke engines, maintenance schedule is reduced to every 4,320 hours of operation or annually, whichever comes first**

**Monitoring, Installation, Operation & Maintenance Requirements**

- **40 CFR § 63.6605:** Operate and maintain the stationary RICE according to the manufacturer's written instructions or your own maintenance plan to maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions
- **40 CFR § 63.6625(e):** Operate and maintain the stationary RICE according to the manufacturer's written instructions or your own maintenance plan to maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions
- **40 CFR § 63.6625(h):** Minimize the engine's time spent at idle during startup and minimize the engine's startup time to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes, after which time the emission standards applicable to all times other than startup in Tables 1a, 2a, 2c, and 2d apply.
- **40 CFR § 63.6625(i):** An oil analysis program may be followed in lieu of scheduled oil change specified in Table 2d. The oil analysis must be performed at the same frequency specified for changing the oil and must at a minimum analyze Total Acid Number, viscosity, and percent water content. The condemning limits for these parameters are:
  - Total Acid Number increases by more than 3.0 milligrams of KOH per gram from Total Acid Number of the oil when new
  - Viscosity of the oil has changed by more than 20 percent from the viscosity of the oil when new
  - Percent water content (by volume) is greater than 0.5.

If any of the limits are exceeded, change the oil within 2 days of receiving the results of the analysis or before commencing operation, whichever is later. Keep records of the parameters that are analyzed as part of the program, the results of the analysis, and the oil changes for the engine. The analysis program must be part of the maintenance plan for the engine

**Continuous Compliance**

- **40 CFR § 63.6605:** Operate and maintain the engine, including associated air pollution control equipment and monitoring equipment, in a manner consistent with safety and good air pollution control practices for minimizing emissions.
- **40 CFR § 63.6640:** Report each instance in which you did not meet each emission limitation or operating limitation.

**Recordkeeping**

- **40 CFR § 63.6655:** Records of all required maintenance performed on the air pollution control and monitoring equipment.
Previous Engine Requirements

• Emergency Engines (Contiguous Only)
  – Record Run Times for ~20 Engines
    • Facilities Personnel Capture runtimes
    • EH&S obtain runtimes and enter into database.

• Non-Emergency Engines (Contiguous Only)
  – Record Run Times for 3 Engines
    • Power plant Historian Capture runtimes
    • EH&S obtain runtimes and enter into database.
    • Calculate Emissions
New Requirements per RICE MACT (Highlights Only)

- **Emergency Engines (Including Non-Contiguous)**
  - Record Run Times for 42 Engines
    - Many Engines located off Campus
    - Engine Run Times not currently captured.
      - Non-Emergency Runtime not to exceed 100 hours annually
    - Tune ups for some engines
    - Oil changes or oil testing for some engines
    - EPA Reporting

- **Non-Emergency Engines**
  - Record Run Times for 3 Engines
    - Power plant Historian Capture runtimes
    - EH&S obtain runtimes and enter into database.
    - Calculate Emissions
  - Catalyst temperature and pressure drop monitoring
  - Emissions Testing (Every 3 Years or 8,760 Hours)
  - Additional record keeping for demand response
  - EPA Reporting

- **New Engines**
  - Must meet proper EPA Tier Requirements
  - Same Requirements as above…plus
  - Additional Requirements depending on EPA Tier
How Many Engines?
How to Monitor Runtimes for so Many Engines???
Loggers?
Data Loggers
Data Loggers
Path to Continued Compliance

• Install data monitors and initiate electronic recordkeeping
• Retrieve Data from Loggers Monthly at a minimum
• Track maintenance records and oil analysis
• EPA annual notifications
• Significant additional Staff Time to perform all compliance activities
How can we have a sustainable compliance program?

Needed to hire additional staff
Handsome Dan?
Dan
Shuttle
Equipment Cost

• $92 per logger and we bought ~60
• $75 per license we bought 2
• $280 for the data shuttle
• $350 for the 2 in 1 small laptop/tablet
Those really were the droids you were looking for...

HINDSIGHT
Those really were the droids you were looking for.

Those really were the droids you were looking for…
Questions?