

Overview of Stationary RICE NESHAP

SIPRAC
July 14, 2011

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RICE NESHAP – Overview

- ▶ 40 CFR part 63 subpart ZZZZ
- ▶ Regulates emissions from stationary reciprocating internal combustion engines (RICE) at both major and area sources of hazardous air pollutants
 - All sizes of engines are covered
 - Estimate more than 1 million stationary RICE in U.S.
- ▶ Typical applications include:
 - Power generation (including emergency backup power)
 - Oil and gas production and transmission
 - Pumping water (wastewater, irrigation, fire suppression)
 - Industrial process (compressors, rock crushers, welders)

Acronyms

- ▶ CI: compression ignition (diesel)
- ▶ SI: spark ignition (gas [natural gas, landfill gas, gasoline, propane, etc.])
 - 2SLB: 2-stroke lean burn
 - 4SLB: 4-stroke lean burn
 - 4SRB: 4-stroke rich burn
 - LFG/DG: landfill gas/digester gas

- ▶ 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)

Stationary vs. Nonroad

- ▶ Stationary means not used in a motor vehicle and not a nonroad engine
 - 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 (shorter time period if seasonal source)



VS.



RICE NESHAP: 2004

		MAJOR SOURCES		AREA SOURCES		
		EXISTING	NEW	EXISTING	NEW	
≤ 500 HP						
> 500 HP			EXISTING	NEW	EXISTING	NEW
			2004 rule	2004 rule		

Covered engines > 500 HP located at major sources

RICE NESHAP: 2008

	MAJOR SOURCES		AREA SOURCES	
≤ 500 HP	EXISTING	NEW 2008 rule	EXISTING	NEW 2008 rule
> 500 HP	EXISTING 2004 rule	NEW 2004 rule	EXISTING	NEW 2008 rule

Added new engines ≤ 500 HP located at major sources, plus all new engines at area sources

RICE NESHAP: 2010

	MAJOR SOURCES		AREA SOURCES	
≤ 500 HP	EXISTING 2010 rules	NEW 2008 rule	EXISTING 2010 rules	NEW 2008 rule
> 500 HP	EXISTING 2004 rule 2010 rule (non-emergency CI)	NEW 2004 rule	EXISTING 2010 rules	NEW 2008 rule

Added existing engines ≤ 500 HP located at major sources, all existing engines at area sources, and existing non-emergency CI engines >500 HP at major sources

RICE NESHAP Applicability

- ▶ Engines >500 HP at major source
 - Existing if constructed before December 19, 2002
 - New if constructed on or after December 19, 2002
 - Reconstructed if reconstruction began after December 19, 2002
- ▶ Engines ≤ 500 HP located at major source of HAP, and engines of all HP located at an area source of HAP
 - Existing if constructed before June 12, 2006
 - New if constructed on or after June 12, 2006
 - Reconstructed if reconstruction began after June 12, 2006
- ▶ Existing emergency engines located at residential, institutional, or commercial area sources are not covered
 - Engine must meet subpart ZZZZ definition of emergency engine

EPA Emergency Engine Requirements

- ▶ No limits on hours of operation for emergency service
- ▶ Maintenance checks & readiness testing limited to 100 hrs/yr
 - If engine is >500 HP, located at a major source, and installed prior to June 12, 2006, there is no limit on maintenance/testing hours
- ▶ 50 hrs/yr allowed for non-emergencies
 - Counts as part of the 100 hr/yr maintenance & testing limit
- ▶ Engine cannot be used for peak shaving or as part of financial arrangement with another entity, except 15 of the 50 non-emergency hrs/yr can be used for demand response in emergency situations (e.g., imminent blackout)
 - Engines that are >500 HP, located at a major source, and installed prior to June 12, 2006 do not have the allowance for 15 hours of demand response

CT Emergency Engine Requirements

According to Sec. 22a-174-22(a)(3) of the RCSA, “emergency engine” means a stationary reciprocating engine or a turbine engine which:

- ▶ Provides mechanical/electrical power only during periods of
 - testing and scheduled maintenance or
 - during an emergency or
 - in accordance with a contract ensuring electricity for use within the state of CT during an OP-4, Step 6 event
- ▶ Does not include an engine for which the owner/operator is party to any other agreement to sell electrical power from such engine to an electricity supplier, or otherwise receives any reduction in the cost of electrical power for agreeing to produce power during periods of reduced voltage or reduced power availability.

Note: Engines operating under RCSA Sections 22a-174-3b and 3c must comply with additional requirements

Federal vs. State Requirements

Federal Only	Common to Both	State Only
<ul style="list-style-type: none"> •Maintenance checks/readiness testing: 100 hr/yr limit •Non-emergencies: 50 hr/yr limit •15 of the 50 non-emergency hrs can be used for emergency demand response (e.g., imminent blackout) •Cannot be used for peak shaving 	<ul style="list-style-type: none"> •Emergency hrs of operation: no limit (unless subject to 22a-174-3b or 3c) •Engine cannot be used as part of any other agreement or financial arrangement with another entity 	<ul style="list-style-type: none"> •Only operate during emergencies, maintenance/scheduled testing, or during an OP-4, Step 6 event <p>If operating under RCSA Sec. 22a-174-3b:</p> <ul style="list-style-type: none"> •Emergency hrs of operation: 300 hr/yr limit •Any nongaseous fuel consumed by engine shall not exceed sulfur content of 0.0015%, dry basis <p>If operating under RCSA Sec. 22a-174-3c:</p> <p>No restriction on hours of use or fuel sulfur content however total facility purchases of fuel are very extremely limited</p>

Emission Standards – Existing RICE Located at Major Sources

HP	Engine Subcategory					
	Non-emergency					Emergency
	CI	SI 2SLB	SI 4SLB	SI 4SRB	SI LFG/DG	
<100	Work practice standards					Work practice standards
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 (2004 rule)	No standards (2004 rule)	350 ppb CH ₂ O or 76% CH ₂ O reduction (2004 rule)	No standards (2004 rule)	No standards (2004 rule)

Limits in yellow are expected to require emissions control retrofit

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 Located 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 (also comply with CI NSPS)	12 ppm CH ₂ O or 58% CO reduction (also comply with SI NSPS)	14 ppm CH ₂ O or 93% CO reduction (also comply with SI NSPS)	350 ppb CH ₂ O or 76% CH ₂ O reduction (also comply with SI NSPS)	No standards (also comply with SI NSPS)	No standards (also comply with CI/SI NSPS)

Limits in yellow are expected to require emissions control retrofit

Notes: New limited use engines >500 HP at major sources do not have to meet any emission standards under the NESHAP. New engines may also be subject to the NSPS.

Emission Standards – Existing RICE Located at Area Sources

HP	Engine Subcategory					
	Non-emergency					Emergency or Black start
	CI	SI 2SLB	SI 4SLB	SI 4SRB	SI LFG/DG	
≤300	Mgmt practice standards	Mgmt practice standards	Mgmt practice standards	Mgmt practice standards	Mgmt practice standards	Mgmt practice standards
300–500	49 ppm CO or 70% CO reduction*					
>500	23 ppm CO or 70% CO reduction*					

Limits in yellow are expected to require emissions control retrofit

*Except engines in rural Alaska

**If engine used >24 hrs/yr

Emission Standards – New RICE Located at Area Sources

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

Compliance Requirements

Engine Subcategory	Compliance Requirements
<p>EXISTING NON-EMERGENCY ENGINES</p> <p><u>At Major Source</u></p> <ul style="list-style-type: none"> •CI \geq 100 HP •SI 100–500 HP <p><u>At Area Source</u></p> <ul style="list-style-type: none"> •CI > 300 HP •SI > 500 HP <p>(4SLB or 4SRB and used >24 hrs/year)</p>	<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><u>Existing non-emergency CI > 300 HP:</u></p> <ul style="list-style-type: none"> •Ultra low sulfur diesel (except rural Alaska) •Crankcase emission control requirements

Compliance Requirements

Engine Subcategory	Compliance Requirements
<p>EXISTING ENGINES</p> <p><u>At Major Source</u></p> <ul style="list-style-type: none"> • < 100 HP • Emergency/black start ≤ 500 HP <p><u>At Area Source</u></p> <ul style="list-style-type: none"> • Emergency/black start • Non-emergency CI ≤ 300 HP • Non-emergency SI ≤ 500 HP • Non-emergency SI 2SLB > 500 HP • Non-emergency SI LFG/DG > 500 HP • Non-emergency SI > 500 HP (4SLB or 4SRB and used ≤ 24 hrs/year) 	<ul style="list-style-type: none"> • Change oil/filter, inspect air cleaner or spark plugs, hoses/belts on prescribed schedule • 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

Compliance Requirements

Engine Subcategory	Compliance Requirements
<p data-bbox="63 454 703 496">NON-EMERGENCY ENGINES</p> <p data-bbox="63 568 440 611"><u>At Major Source</u></p> <ul data-bbox="63 625 743 839" style="list-style-type: none"><li data-bbox="63 625 743 668">•Existing/new 4SRB > 500 HP<li data-bbox="63 682 589 725">•New SI 2SLB > 500 HP<li data-bbox="63 739 589 782">•New SI 4SLB > 250 HP<li data-bbox="63 796 454 839">•New CI > 500 HP	<ul data-bbox="794 454 1767 896" style="list-style-type: none"><li data-bbox="794 454 1584 496">•Initial emission performance test<li data-bbox="794 511 1700 668">•Subsequent performance testing semiannually (can reduce frequency to annual)*<li data-bbox="794 682 1767 782">•Operating limitations – catalyst pressure drop and inlet temperature<li data-bbox="794 796 1110 839">•Notifications<li data-bbox="794 853 1545 896">•Semiannual compliance reports

*Subsequent testing required for 4SRB engine complying with CH₂O % reduction only if engine is ≥5,000 HP

Compliance Requirements

Engine Subcategory	Compliance Requirements
•New emergency/limited use >500 HP at major source	•Initial notification only
•New non-emergency LFG/DG >500 HP at major source	•Initial notification •Monitor/record fuel usage daily •Annual report of fuel usage

Notifications and Reporting

Notifications

- Applicability– 120 days after effective date or construction/reconstruction
- Actual startup– 15 days after actual startup
- Performance test– 60 days prior to test
- Initial Notification of Compliance– 60 days after compliance demonstrated

Compliance Reports

- Semiannual or annual depending on engine

When are these required?

- Notifications/reports generally required for engines subject to numeric CO or formaldehyde limits
- **Exception**– Initial notification only for new engines >500 HP at major sources that are emergency, limited use, or LFG/DG

Startup, Shutdown, Malfunction: Response to Court Decision

- ▶ Emission standards apply during shutdowns and malfunctions
- ▶ Startup and idling time must be kept to 30 minutes or less, after which, normal standards apply [40 CFR 63.6625(h)]
- ▶ Also applies to engines covered by 2004 and 2008 RICE NESHAP

Key Dates

- ▶ Initial applicability notifications for engines subject to 2010 amendments 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

RICE NESHAP – Next Steps

- ▶ Petitions for reconsideration and review
 - 15 hours for emergency demand response
 - Final determination has not been made
- ▶ Implementation materials
 - <http://www.epa.gov/ttn/atw/rice/ricepg.html#IMP>
 - Example notifications
 - Example compliance reports
 - Applicability flow chart
 - Summary table with applicable requirements
 - Implementation software

Stationary CI Engine NSPS

- ▶ 40 CFR part 60 subpart III
- ▶ Affects new, modified, and reconstructed stationary CI engines
- ▶ Initially promulgated on July 11, 2006
- ▶ Amendments signed June 28, 2011

Who is Subject to the CI NSPS?

- ▶ Manufacturers of 2007 model year or later stationary CI engines <30 liters/cylinder displacement
 - Model years differ for fire pump engines
- ▶ Owners/operators of engines
 - constructed (ordered) after 7/11/2005 and manufactured after 4/1/2006 (7/1/2006 for fire pump engines)
 - modified/reconstructed after 7/11/2005

Emission Standards

- ▶ Phased in over several years and have Tiers with increasing levels of stringency
- ▶ Output-based, units of g/KW-hr (g/HP-hr)
- ▶ Pollutants: NO_x, PM, CO, NMHC
- ▶ Smoke standards as a %
- ▶ SO_x reduced through use of low sulfur fuel
- ▶ Modeled after EPA's standards for nonroad and marine engines

CI Engine NSPS – Compliance

- ▶ Engine manufacturers must certify 2007 model year and later engines with a displacement <30 liters/cylinder
 - Certification = EPA Certificate of Conformity
- ▶ Owner/operator complies by:
 - Purchasing certified engine
 - Install, configure, operate and maintain engine per manufacturer's instructions or manufacturer-approved procedures
 - Owner/operator performance testing not required

Stationary SI Engine NSPS

- ▶ 40 CFR part 60 subpart JJJ
- ▶ Affects new, modified, and reconstructed stationary SI engines
- ▶ Initially promulgated on January 18, 2008
- ▶ Amendments signed June 28, 2011

Who is Subject to the SI NSPS?

- ▶ Manufacturers of stationary SI engines:
 - ≤ 25 HP and manufactured on/after 7/1/2008
 - > 25 HP, gasoline or rich burn LPG, manufactured on/after 7/1/2008 (on/after 1/1/2009 for emergency engines)
 - voluntarily certified engines manufactured on/after
 - 7/1/2007 > 500 HP (except lean burn $500 \leq \text{HP} < 1,350$)
 - 1/1/2008 lean burn $500 \leq \text{HP} < 1,350$
 - 7/1/2008 < 500 HP
 - 1/1/2009 emergency engines

Who is Subject to the SI NSPS? (cont'd)

Owners/operators of engines:

- ▶ constructed after 6/12/2006 and
 - >500 HP manufactured on/after 7/1/2007 (except lean burn $500 \leq \text{HP} < 1,350$)
 - lean burn $500 \leq \text{HP} < 1,350$ manufactured on/after 1/1/2008
 - <500 HP manufactured on/after 7/1/2008
 - emergency >25 HP manufactured on/after 1/1/2008
- ▶ modified/reconstructed after 6/12/2006

Emission Standards

- ▶ Phased in over several years and have Tiers with increasing levels of stringency
- ▶ Output-based, units of g/KW-hr (g/HP-hr)
- ▶ ppmvd@15% O₂ standards for some engines
- ▶ Pollutants: NO_x, CO, VOC
- ▶ Sulfur limit on gasoline
- ▶ Some standards modeled after EPA's standards for nonroad SI engines

SI Engine NSPS – Compliance

- ▶ Engine manufacturers must certify engines ≤ 25 HP, gasoline engines, and rich burn LPG engines
- ▶ Engine manufacturers can elect to certify other engines
- ▶ Owner/operator complies by either:
 - If certified engine, install, configure, operate and maintain engine per manufacturer's instructions or manufacturer-approved procedures
 - If uncertified, conduct performance test (requirements vary depending on engine size)

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