EPA's Air Quality Regulations for Stationary Engines

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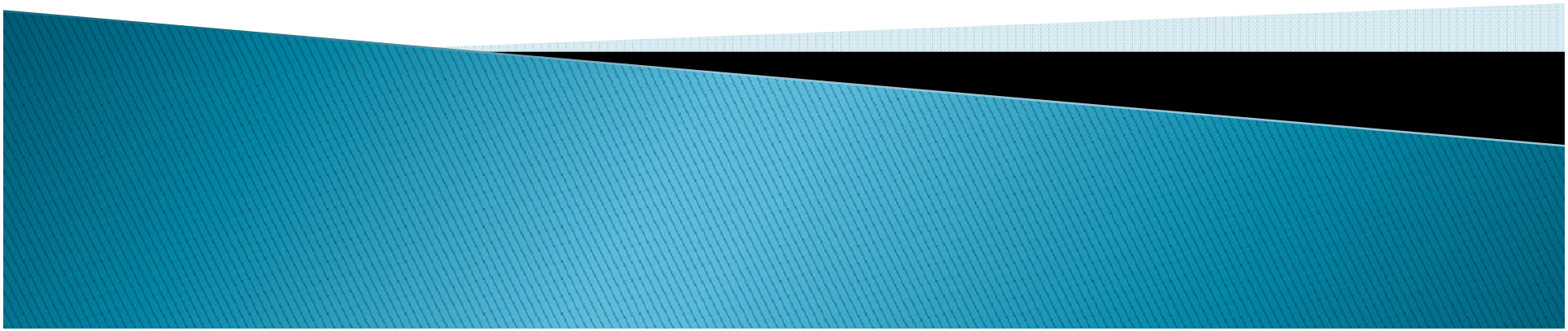


Agenda

- Overview of EPA's emission standards for stationary engines:
  - NESHAP for Stationary Reciprocating Internal Combustion Engines (RICE)
  - NSPS for Stationary Compression Ignition (CI) Internal Combustion Engines (ICE)
  - NSPS for Stationary Spark Ignition (SI) ICE
- Q&A

What are the Differences?

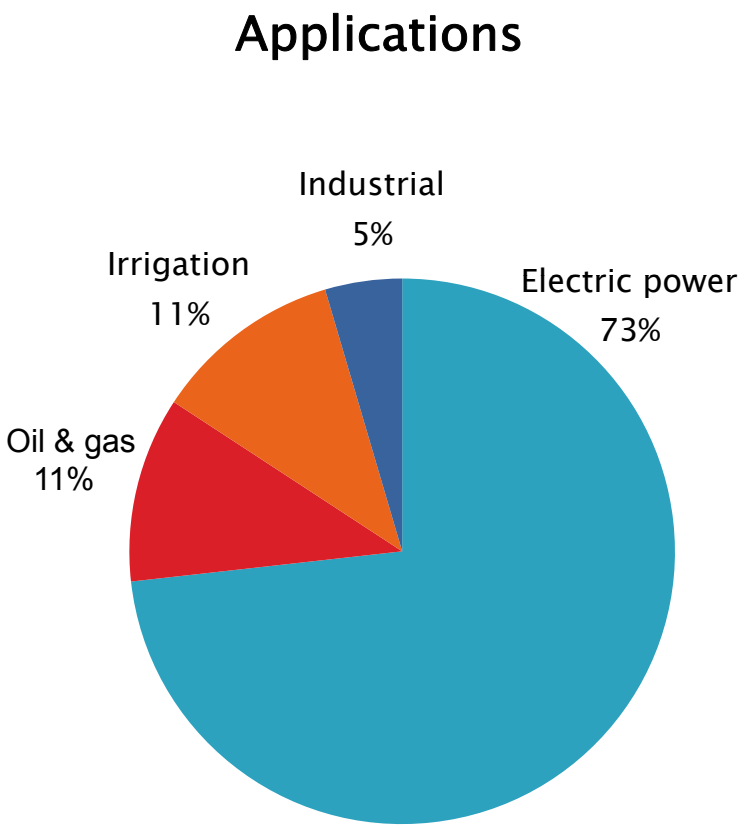
- RICE NESHAP
  - Applies to existing, new, and reconstructed stationary engines (both CI and SI)
  - Applies to engine owners/operators
  - Focus is air toxics (HAP)
  - Established under CAA section 112

- CI/SI ICE NSPS
  - Applies to new, modified, and reconstructed stationary CI/SI engines
  - Applies to engine manufacturers and owners/operators
  - Focus is criteria pollutants
  - Established under CAA section 111

Acronyms

- CAA: Clean Air Act
- CFR: Code of Federal Regulations
- CH_2O: Formaldehyde
- CI: Compression ignition
- CO: Carbon monoxide
- FR: Federal Register
- HAP: Hazardous air pollutants
- HP: Horsepower
- l/cyl: liters/cylinder
- NESHAP: National Emission Standards for Hazardous Air Pollutants
- NOx: Nitrogen oxides
- NSPS: New Source Performance Standards
- PM: Particulate matter
- RICE: Reciprocating internal combustion engine
- SI: Spark ignition
  - 2SLB: 2-stroke lean burn
  - 4SLB: 4-stroke lean burn
  - 4SRB: 4-stroke rich burn
  - LFG/DG: landfill gas/digester gas
- THC: Total hydrocarbons
- VOC: Volatile organic matter

Stationary RICE at a Glance



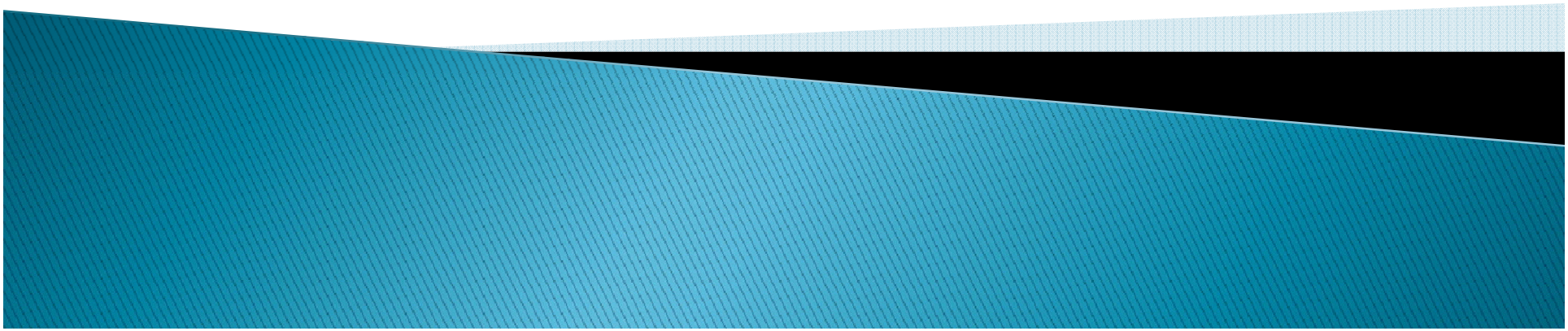
- ~1.5 million stationary engines in U.S.
  - 78% CI, 22% SI
  - ~ 900,000 used for emergency power
- Sizes range from 1 kW to >10 MW
- Main HAP emitted: formaldehyde, acetaldehyde, acrolein, methanol, and PAH
- Main criteria pollutants emitted: NOx, CO, VOC, PM

Stationary vs. Mobile

- 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 (note different time criteria for seasonal source)

VS.

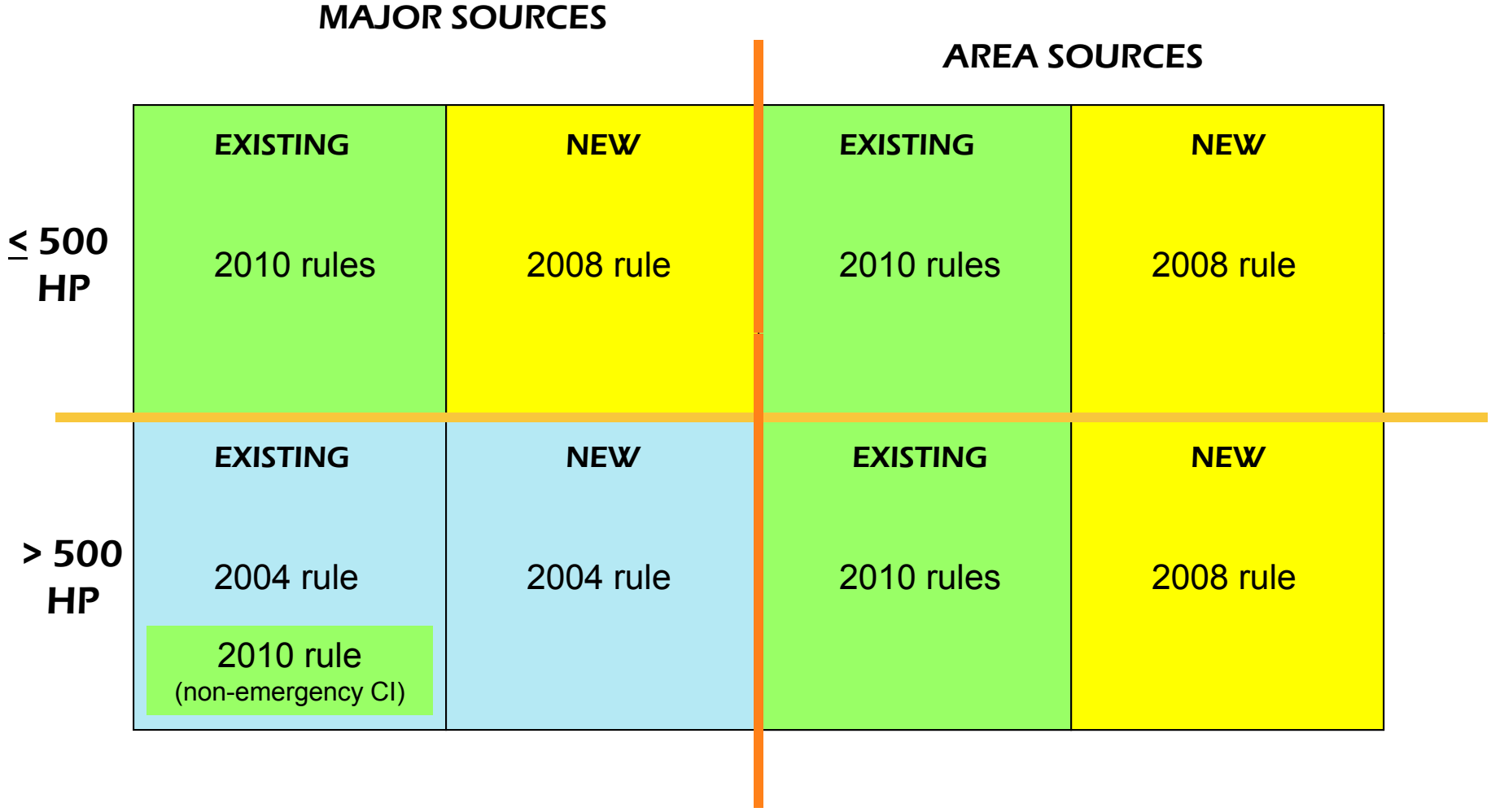
Stationary RICE NESHAP



RICE NESHAP – Overview

- 40 CFR part 63 subpart ZZZZ
- Regulates HAP emissions from stationary RICE at both major and area sources of HAP
  - All sizes of engines are covered
- **ONLY EXEMPTION**: existing emergency engines located at residential, institutional, or commercial area sources

RICE NESHAP Timeline



Existing vs. New

	>500 HP at major source	≤500 HP at major source or all HP at area source
Existing	construction commenced before December 19, 2002	construction commenced before June 12, 2006
New	construction commenced on or after December 19, 2002	construction commenced on or after June 12, 2006
Reconstructed	reconstruction commenced after December 19, 2002	reconstruction commenced after June 12, 2006

- 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

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	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_2O	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_2O or 76% CH_2O reduction (2004 rule)	No standards (2004 rule)	No standards (2004 rule)

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: 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	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	Change oil/ filter, inspect spark plugs, & inspect hoses/ belts every 1,440 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
300-500	49 ppm CO or 70% CO reduction*					
>500	23 ppm CO or 70% CO reduction*		47 ppm CO or 93% CO reduction**	2.7 ppm CH_2O or 76% CH_2O reduction**		

*Except engines in rural Alaska
**If engine used >24 hrs/yr

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_2O or 93% CO reduction (also comply with SI NSPS)			
>500	580 ppb CH_2O or 70% CO reduction (also comply with CI NSPS)	12 ppm CH_2O or 58% CO reduction (also comply with SI NSPS)		350 ppb CH_2O or 76% CH_2O reduction (also comply with SI NSPS)	No standards (also comply with SI NSPS)	No standards (also comply with CI/SI NSPS)

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 – New RICE Located at Area Sources

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

Oil Analysis Programs

	CI RICE Condemning Limits	SI RICE Condemning Limits
Total Base #	<30% of the TBN of the oil when new	NA
Total Acid #	NA	Increases by more than 3.0 mg of KOH per gram from TAN of the oil when new
Viscosity	Changed by more than 20% from the viscosity of the oil when new	Changed by more than 20% from the viscosity of the oil when new
% Water Content (By Volume)	>0.5	>0.5

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

Startup and Shutdown

- Startup and idling time must be kept to 30 minutes or less, after which, normal emission standards apply
- Normal emission standards apply during shutdowns

HAP Emission Controls

- CI and SI lean burn engines
  - Oxidation catalyst
    - Estimated capital cost:
      - CI: $27.4*HP – $939
      - SI 4SLB: $12.8*HP + $3,069
    - Estimated annual cost:
      - CI: $4.99*HP + $480
      - SI 4SLB: $1.81*HP + $3,442
- SI 4SRB engines
  - Non-selective catalytic reduction (3-way catalyst)
    - Estimated capital cost: $24.9*HP + $13,118
    - Estimated annual cost: $4.77*HP + $5,679

Emergency Engine Requirements

Category	Yearly Limit	Exceptions
Emergency Service	No limits	None
Maintenance Checks & Readiness Testing	100 hours	If engine is >500 HP, at a major source, and installed prior to June 12, 2006, no limit on maintenance/testing
Non-Emergencies	50 hours Counts as part of the 100 hr/yr maintenance limit Peak shaving not allowed	None
Demand Response	15 hours in emergency situations Counts as part of the 50 hr/yr non-emergency limit	Engines >500 HP, at a major source, and installed prior to June 12, 2006 **do not** have the allowance for 15 hours of demand response

Compliance Requirements

Engine Subcategory	Compliance Requirements
<u>Existing non-emergency:</u> •CI ≥100 HP at major source •CI >300 HP at area source •SI 100-500 HP at major source •SI 4SLB/4SRB >500 HP at area source used >24 hours/year	•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) Existing non-emergency CI >300 HP: •Ultra low sulfur diesel (except rural Alaska) •Crankcase emission control requirements

Compliance Requirements

Engine Subcategory	Compliance Requirements
Existing emergency/black start: •<100 HP at major source •≤500 HP at major source •at area source Existing non-emergency: •<100 HP at major source •CI ≤300 HP at area source •SI ≤500 HP at area source •SI 2SLB >500 HP at area source •SI LFG/DG >500 HP at area source •SI 4SLB/4SRB >500 HP at area source used ≤24 hours/year	•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
<u>Existing non-emergency:</u> •SI 4SRB >500 HP at major source <u>New non-emergency:</u> •SI 2SLB >500 HP at major source •SI 4SLB >250 HP at major source •SI 4SRB >500 HP at major source •CI>500 HP at major source	•Initial emission performance test •Subsequent performance testing semiannually (can reduce frequency to annual)* •Operating limitations – catalyst pressure drop and inlet temperature •Notifications •Semiannual compliance reports

*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

Determining RICE NESHAP Requirements for your Engine

- RICE NESHAP TTN website
  - http://www.epa.gov/ttn/atw/rice/ricepg.html
    - Example notifications and compliance reports
    - Applicability flow chart
    - Summary table with applicable requirements
    - Regulation Navigation tool
- Electronic CFR
  - http://www.gpoaccess.gov/ecfr

Key Dates

Engine Type	Compliance Date
Existing RICE >500 HP at major sources	June 15, 2007
Existing CI RICE (except emergency CI >500 HP at major sources)	May 3, 2013
Existing SI RICE: •≤500 HP at major sources •all HP at area sources	October 19, 2013
New engines	Upon startup

- Initial applicability notifications were due:
  - August 31, 2010 for existing CI RICE
  - February 16, 2011 for existing SI RICE

Compliance Extension [§63.6(i)]

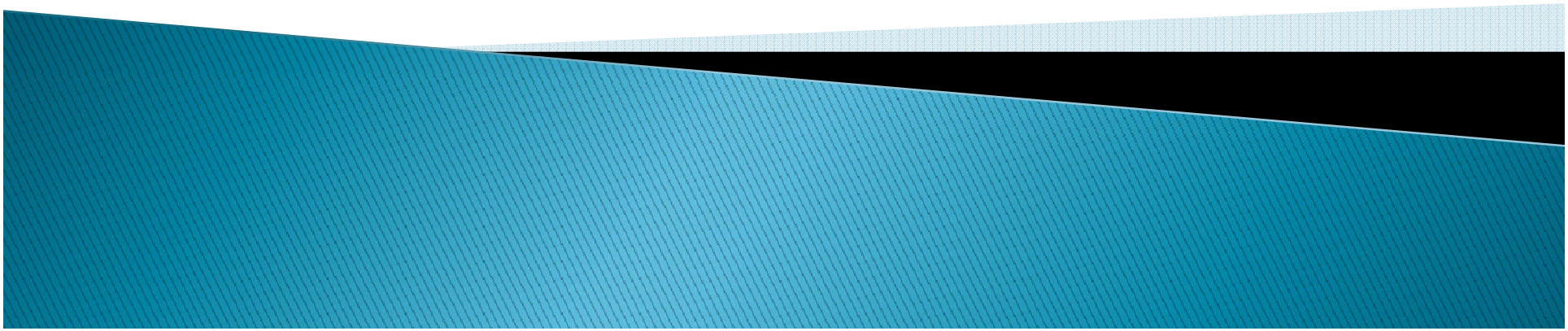
- Under 40 CFR 63.6(i),
  - EPA can grant up to 1 year if necessary to install controls
- State can also approve if
  - Delegated the NESHAP, or
  - The source is required to obtain a Title V operating permit, and state has an approved permit program
- Application process
  - Submit written request to EPA regional office or state 120 days in advance of the compliance date (unless the need arose later due to circumstances beyond reasonable control)
  - Include a schedule for construction and final compliance and description of the controls

RICE NESHAP – Next Steps

- After promulgation of the 2010 amendments, EPA received several petitions for reconsideration, petitions for judicial review, and other communications regarding several issues with the final rules

- Proposed amendments on June 7, 2012 (77 FR 33812)

Stationary ICE NSPS



Stationary CI Engine NSPS

- 40 CFR part 60 subpart IIII
- Affects new, modified, and reconstructed stationary CI engines
- Originally promulgated July 11, 2006
- Amended 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 stationary 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

Modification/Reconstruction

- Modification
  - Physical or operational change to an existing facility which results in an increase in the emission rate to the atmosphere of a regulated pollutant
  - See 40 CFR 60.14
- Reconstruction
  - Replacement of components of an existing facility to such an extent that the fixed capital cost of the new components exceeds 50 percent of the fixed capital cost of a comparable entirely new facility, and it is technologically and economically feasible to meet the applicable standards
  - See 40 CFR 60.15 and 63.2

Emission Standards
Engines with displacement <10 liters/cylinder

- Pre-2007 model year engines
  - Meet emission standards equivalent to Tier 1standards for nonroad CI engines
- 2007 model year and later
  - Meet emission standards equivalent to Tier standards for nonroad CI engines
    - Tier 2/3 in part 89, Tier 4 in part 1039
  - Emergency engines >50 HP only have to meet Tier 3 standards (or Tier 2 if no Tier 3)
- Fire pump engines
  - Same emission standards, delayed schedule

Emission Standards
Engines with displacement 10-30 liters/cylinder

- Meet emission standards equivalent to Tier standards for marine CI engines
  - Tier 2 in part 94, Tier 3/4 in part 1042
  - Emergency engines do not have to meet the most stringent (Tier 4) standards

Emission Standards

Engines with displacement ≥30 liters/cylinder

- NOx and PM limits
  - NOx limits (g/kW-hr): equivalent to EPA standards for large marine engines
  - PM limit:
    - 60% reduction or 0.15 g/kW-hr for non-emergency
    - 0.40 g/kW-hr for emergency
- Non-emergency limits based on use of SCR and electrostatic precipitator

Fuel Requirements

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

Note: engines not subject to subpart IIII are <u>not</u> subject to these requirements

Requirements for Engine Manufacturers

- Certify 2007 model year and later engines with displacement <30 liters/cylinder
  - Fire pump engines certified beginning model year 2008-2011
  - Certification = EPA Certificate of Conformity
- Not required to certify engines with displacement ≥30 liters/cylinder

CI Engine NSPS – Compliance

- 2007 model year and later CI engine with displacement <30 liters/cylinder (except fire pump engines)
  - purchase certified engine
  - for CI fire pump engine, 2008–2011 model year and later (depending on engine size)
  - Install, configure, operate and maintain engine per manufacturer's instructions or manufacturer-approved procedures
    - Owner/operator performance testing not required
  - Per June 28, 2011 amendments (76 FR 37954), can operate differently than manufacturer's recommendations, but must do performance test to show compliance

CI Engine NSPS – Compliance

- Engines <30 liters/cylinder not required to be certified (Pre-2007 model year, earliest fire pump engines):
  - Choose 1 of 5 options for demonstrating compliance:
    - Purchase certified engine
    - Keep records of performance test conducted on similar engine
    - Keep records of engine manufacturer data indicating compliance
    - Keep records of control device vendor data indicating compliance
    - Conduct initial performance test

CI Engine NSPS – Compliance

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

Monitoring/Recordkeeping/Reporting

Engine Type	Requirement
Emergency Engines	•Non-resettable hour meter and records of operation if engine does not meet non-emergency engine standards
Equipped with diesel particulate filter (DPF)	•Backpressure monitor and records of corrective actions
Non-emergency >3,000 HP or having a displacement >10 liters/cylinder	•Submit initial notification •Keep records of notifications and engine maintenance •If certified, keep records of documentation of engine certification •If not certified, keep records of compliance demonstrations
Pre-2007 model year >175 HP that are not certified	

Provisions for Engines in Remote Alaska

- Pre-2014 model year engines exempted from NSPS fuel requirements
- Allow use of engines certified to marine engine standards, rather than land-based nonroad engine standards
- Engines not required to meet Tier 4 NOx standards
- Engines not required to meet Tier 4 PM standards until 2014 model year
- Allow blending of used lubricating oil
  - In volumes of up to 1.75 percent of the total fuel,
  - If the sulfur content of the used lubricating oil is less than 200 ppm and the used lubricating oil is ‘‘on-spec’’

Stationary SI Engine NSPS

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

Who is Subject to the SI NSPS?

- Manufacturers of stationary SI engines:
  - ≤25 HP and manufactured on/after July 1, 2008
  - >25 HP, gasoline or rich burn LPG, manufactured on/after July 1, 2008 (on/after January 1, 2009 if emergency engines)
  - Voluntarily certified engines manufactured on or after:

Date	Engine Type
July 1, 2007	>500 HP (except lean burn 500≤HP<1,350)
January 1, 2008	lean burn 500≤HP<1,350
July 1, 2008	<500 HP
January 1, 2009	emergency engines

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

Owners/operators of engines:

- Constructed (ordered) after June 12, 2006 **and**

Manufactured On/After	Engine Type
July 1, 2007	500 HP (except lean burn 500≤HP<1,350)
January 1, 2008	Lean burn 500≤HP<1,350
July 1, 2008	<500 HP
January 1, 2009	Emergency >25 HP

- Modified/reconstructed after June 12, 2006

Emission Standards

- Phased in over time with increasing levels of stringency
- Output-based, units of g/KW-hr (g/HP-hr)
- ppmvd@15% O_2 standards for some engines
- Pollutants: NOx, CO, VOC
- Some standards modeled after EPA's standards for nonroad SI engines

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

Fuel Requirements

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

Note: engines not subject to subpart JJJJ are not subject to these requirements.

Compliance Requirements for Engine Manufacturers

- Engine manufacturers must certify engines ≤25 HP, gasoline engines, and rich burn LPG engines
  - Certification = EPA Certificate of Conformity

- Engine manufacturers can elect to certify other engines

Compliance Requirements for Owners/Operators

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

Compliance Requirements for Owners/Operators

- Non-certified engines:
  - Maintenance plan
  - Performance testing
    - 25<HP≤500 – initial test
    - >500 HP – initial test and subsequent every 8,760 hours or 3 years, whichever is first
    - Conduct within 10% of peak (or highest achievable) load

Monitoring Requirements for Owners/Operators

- Install non-resettable hour meter:
  - emergency engine ≥500 HP built on/after July 1, 2010
  - emergency engine 130≤HP<500 built on/after January 1, 2011
  - emergency engine <130 HP built on/after July 1, 2008

This is required only if engine does not meet standards for non-emergency engines

Recordkeeping/Reporting

Requirements include:

- Documentation of certification
- Records of engine maintenance
- Records of hours of operation for emergency engines
- Initial notification for non-certified engines >500 HP
- Results of performance testing within 60 days of test

NSPS Emergency Engine Requirements

- No limits on hours of operation for emergency service
- Maintenance checks/readiness testing limited to 100 hrs/yr
  - Can be more if mandated by Federal, State, or local standards
  - Owner/operator can also petition for more 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, to supply power to the electric grid, or to supply power as part of financial arrangement with another entity

Contact Information

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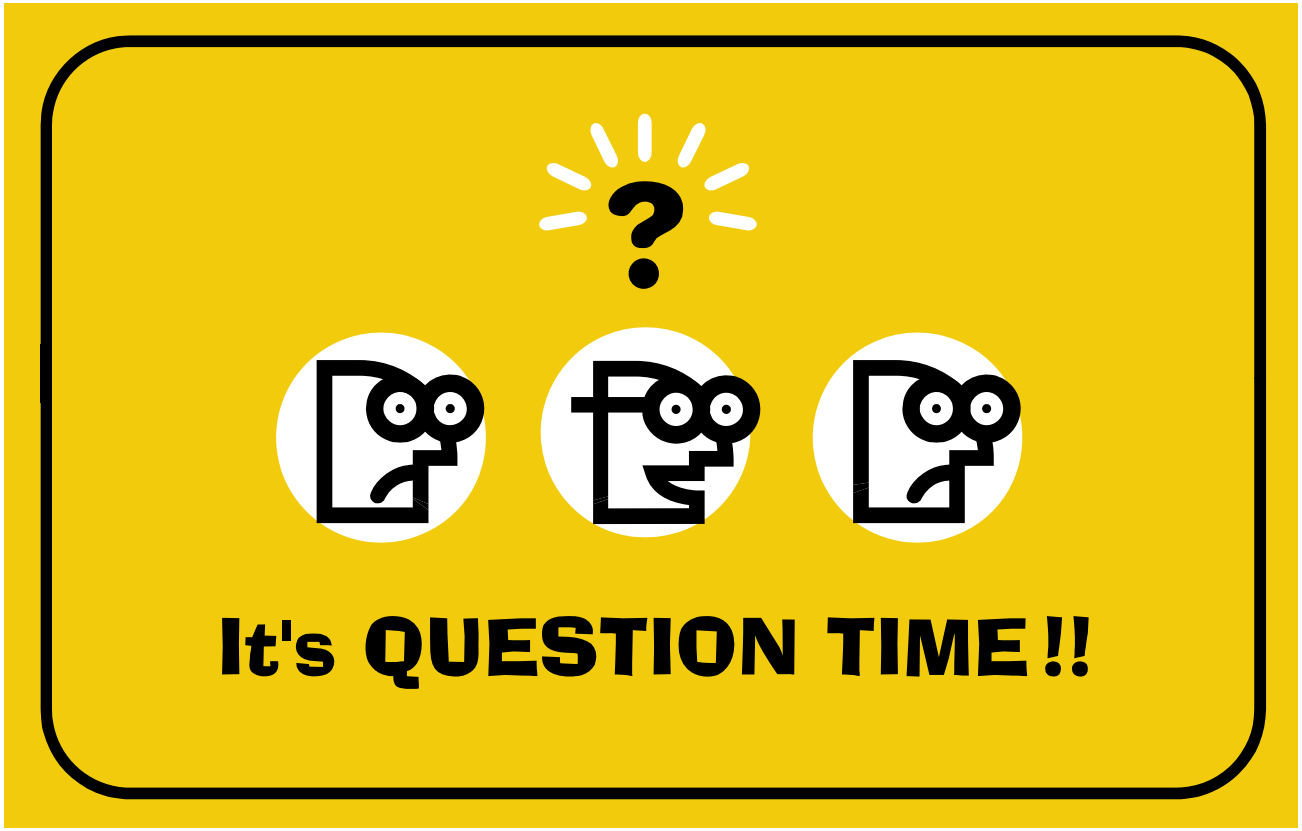
It's QUESTION TIME!!