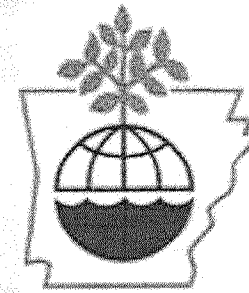




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Arkansas  
Environmental  
Federation

*Industries for the Environment*

# Engine Rules: *Continuing Confusions*

Jeremy Jewell

**Arkansas Environmental Federation  
April 12, 2016 Air Workshop**

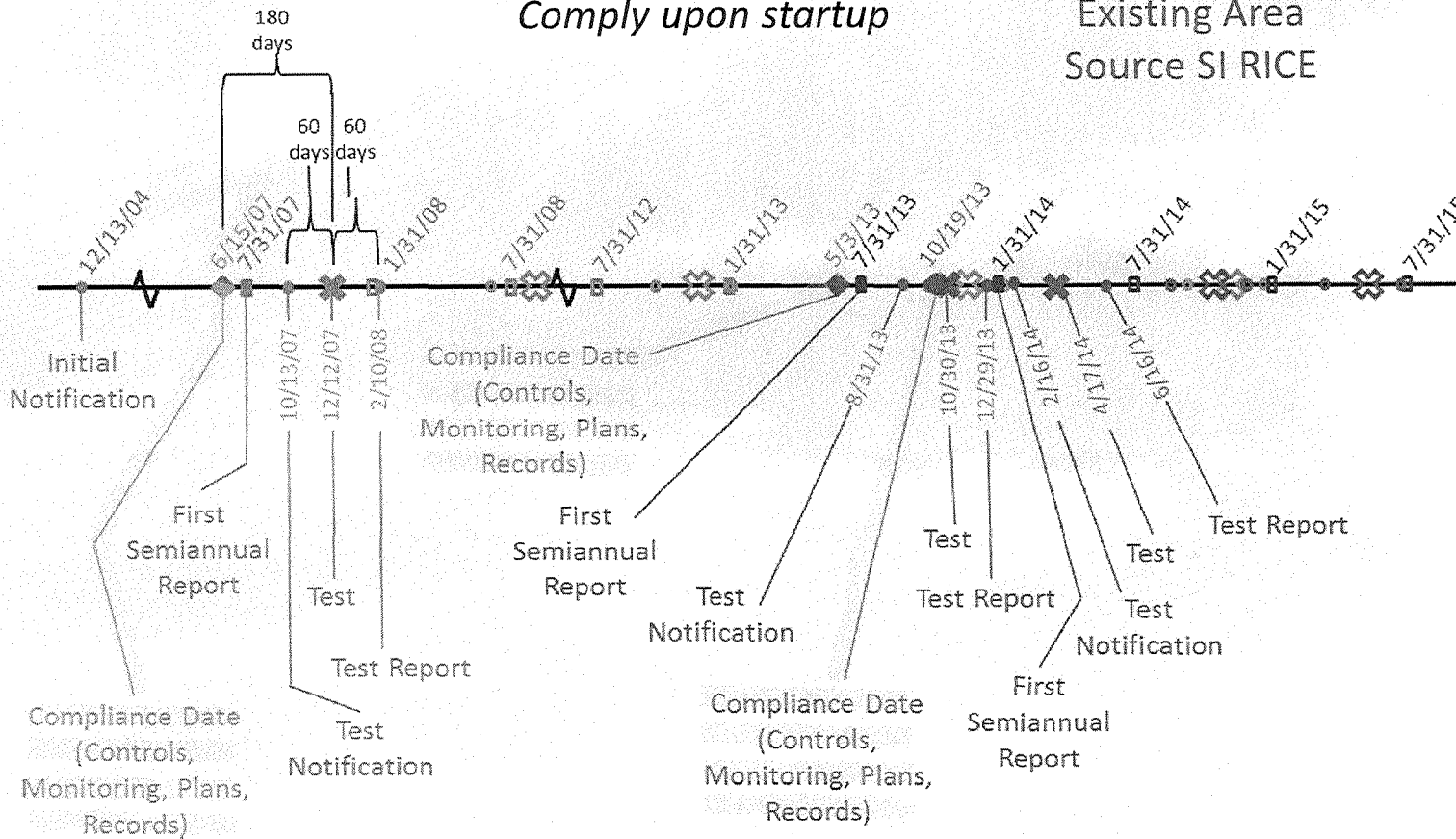
# We're now in overtime

Existing Major  
Source SI RICE  
> 500 hp

Existing CI RICE  
Major and Area

Existing Major  
Source SI RICE  
≤ 500 hp  
and  
Existing Area  
Source SI RICE

*New RICE  
Comply upon startup*

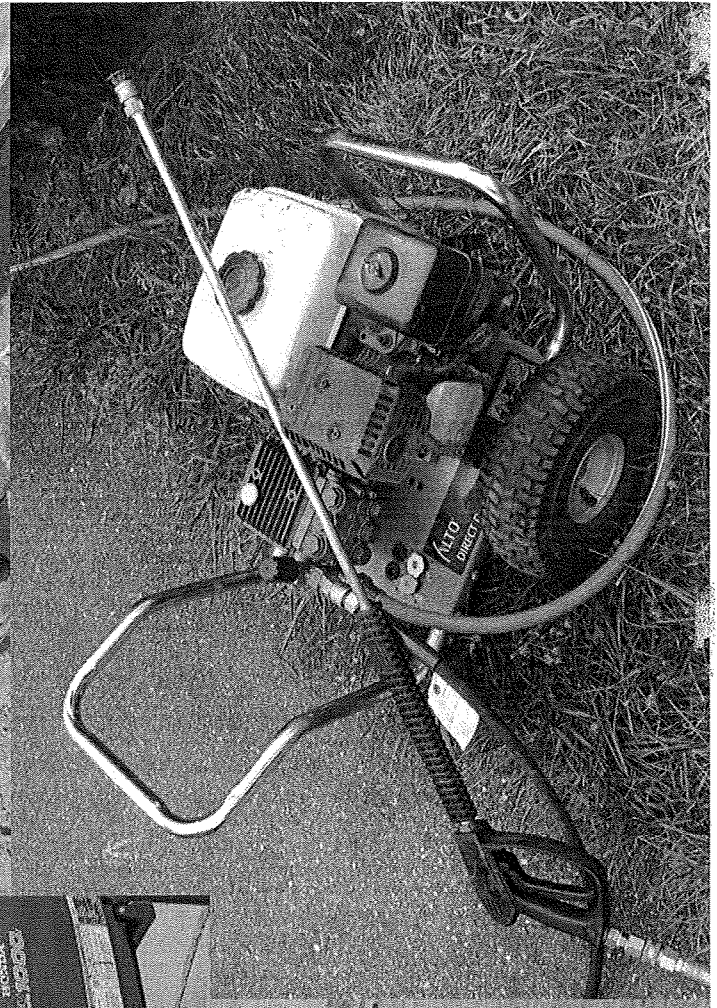


You Are Here Today

# Nonroad engines do not apply

- > Nonroad RICE are not subject to IIII, JJJJ, or ZZZZ
- > Lots of RICE qualify as nonroad
  - ❖ Self-propelled
  - ❖ Propelled while functioning
  - ❖ Portable or transportable
    - ◆ *Designed* to be moved
      - Wheels, skids, handles, etc.
    - ◆ And actually *is* moved routinely
      - Once per year/season
- > Consider both location and purpose

# Potential nonroad engine examples



# Performance test v. compliance demonstration

- > Reference method testing is not required for some engines, even if they have to install controls
  - ❖ Existing, four-stroke, rich or lean burn, > 500 hp, area source, not remote
- > The compliance demonstration is initial and annual catalyst activity checks
  - ❖ Portable electrochemical analyzer (a 15-minute run; not 3-hour tests)
- > No 60-day notification required
- > No site-specific test plan required

# Test method concern

- > Mass emission rates are directly proportional to exhaust gas velocity (flow) so accurate measurements of velocity are critical
- > Method 2 has ~10% error in ideal conditions and worse for engine exhaust
  - ❖ Velocities tend to be large and variable
- > Consider Method 19 instead of Method 2. Will need:
  - ❖ Fuel flow meter
  - ❖ Site-specific gas analysis
  - ❖ Excess air (from  $\text{CO}_2$  /  $\text{O}_2$  concentrations)

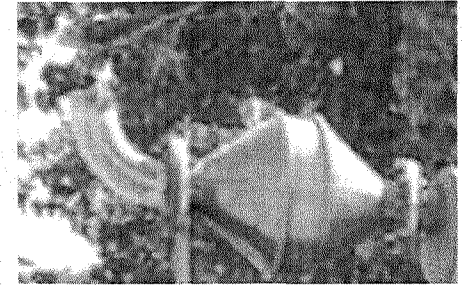
# CPMS deviation reporting

- > Any 4-hour rolling average temperature out of range (450 °F to 1350 °F) is a deviation
  - ❖ No allowances
  - ❖ Averages span shutdown periods
  - ❖ 30 minutes allowed for startups
  
- \* 4-hour rolling averages are based on four 1-hour block averages, each from four 15-minute readings

# Engine control types

## > Oxidation Catalyst

- ❖ Controls CO, HC, organics
- ❖ Typically used with lean-burn RICE
- ❖ Can change the form of  $\text{NO}_x$
- ❖ Can oxidize  $\text{SO}_2$  to  $\text{SO}_3$  and  $\text{NH}_3$  to  $\text{NO}_x$
- ❖ a.k.a., Catalytic Oxidation, OxCat, CatOx, Two-Way Catalyst



## > Non-Selective Catalytic Reduction

- ❖ Controls CO, HC, and  $\text{NO}_x$  from rich-burn RICE
- ❖ Relies on AFRC and exhaust  $\text{O}_2$  sensor to maintain ideal AFR
- ❖ a.k.a., NSCR, Three-Way Catalyst, Catalytic Converter (usually)
- ❖ This is not SNCR (or SCR), which involve ammonia/urea injection

> *All are susceptible to fouling from  $\text{SO}_2$ /PM/metals*



# Engine control types

## > Lean NO<sub>x</sub> Catalyst

- ❖ Controls NO<sub>x</sub> from lean-burn engines (not yet widespread)
- ❖ Requires periodic regeneration - typically done by injecting supplemental fuel

## > Selective Catalytic Reduction (SCR)

- ❖ Controls NO<sub>x</sub> using urea/ammonia injection in presence of a catalyst
- ❖ Principally used on lean-burn engines

## > Selective Non-Catalytic Reduction (SNCR)

- ❖ Controls NO<sub>x</sub> using urea/ammonia injection
- ❖ Requires narrow temp. window typically found only with boilers (included here only to emphasize potential confusion with NSCR)

> *All are susceptible to fouling from SO<sub>2</sub>/PM/metals*

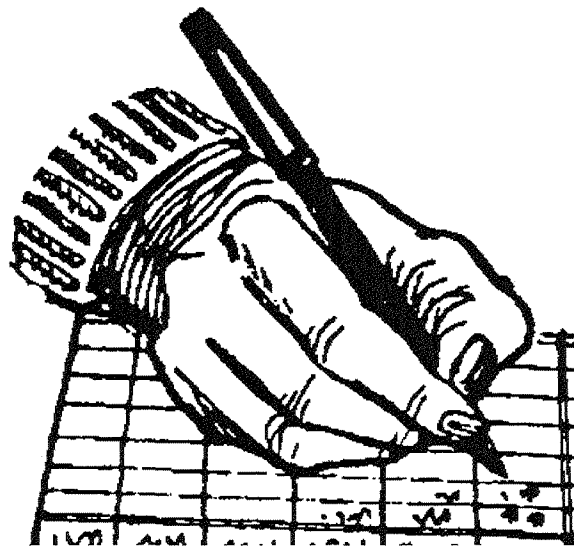
# Section 5 Quiz A

## *Emergency or Not?*

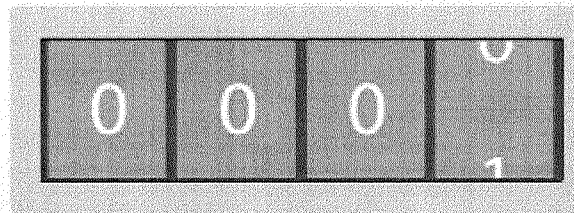
- > Scheduled downtime
- > Leak in the fire sprinkler system
- > Generator/engine system wiring fault (causing engine to run on its own)
- > Internal power plant trips offline
- > Unplanned transformer outage (automatic or manual)
- > Failure of battery backup for data storage
- > Operation in anticipation of power outage (e.g., due to storm)
- > Not emergency
- > Emergency
- > Not emergency
- > Emergency
- > Emergency
- > Emergency
- > Not emergency

# Operation logs

- > A log of total monthly hours is not complete
  - ❖ Even if split into emergency and non-emergency subtotals
- > The record should address each period of operation individually
  - ❖ Include the classification (emergency or nonemergency) and reasoning



# What if you operate an emergency engine more than the allowable non-emergency hours?



- > Based on EPA's April 2, 2013 Q&A document, it is then forever a non-emergency engine
- > Based on EPA's RTC 10.2.1 published with the 2013 rule preamble, a decision will be made on a "case-by-case" basis

# Forget the operational limits

- > For several types of engines, it is easier to comply with non-emergency provisions than with emergency provisions
  - ❖ Maintenance requirements only v. maintenance requirements + hours records
- > Major source existing RICE < 100 hp
- > Area source existing CI RICE < 300 hp
- > Area source existing 4S RICE < 500 hp
- > Area source existing 2S RICE
- > Area source existing 4S remote RICE

# On-line CEDRI reporting for emergency RICE



> Only required if...

❖ > 100 hp

and

❖ Operated or contractually obligated to be available > 15 hours/year for EDR

or

❖ Operated for periods where there is a 5% or greater deviation in voltage or frequency

or

❖ Operated for local grid system reliability

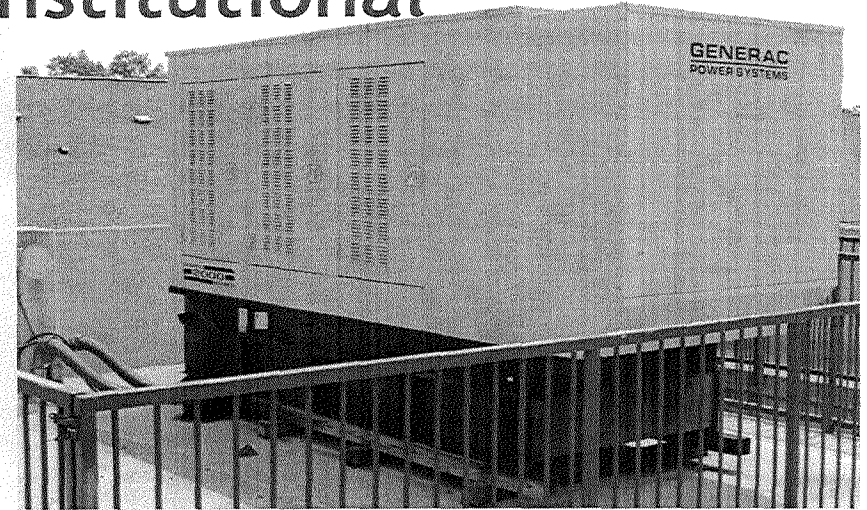
# There is a gap in the regs

- > At an area source, any engine constructed (on-site installation) after 6/12/06 has no ZZZZ requirements
  - ❖ It is still technically an affected source
- > If the same engine was manufactured before the applicable NSPS date, IIII / JJJJ does not apply
  - ❖ NSPS IIII - 4/1/06
  - ❖ NSPS JJJJ - 1/1/08 for lean burn RICE with  $500 \leq \text{HP} < 1350$ 
    - 7/1/07 for other RICE with  $\text{HP} \geq 500$
    - 7/1/08 for RICE with  $\text{HP} < 500$
    - 1/1/09 for emergency RICE with  $\text{HP} > 25$

# Oft-forgotten exemption

## Residential, Commercial, Institutional

- > Only for existing emergency engines at HAP area sources
- > EPA-HQ-OAR-2008-0708
  - ❖ NAICS codes
- > Conflicting informal determinations about engines at office buildings co-located with manufacturing facilities
  - ❖ EPA has said the exemption applies, presumably because such engines were not included in the Urban Air Toxics Strategy Inventory
  - ❖ Some states (not AR) has said it does not
- > We have seen controls come off engines once this exemption is fully understand
- > EPA has recently been criticizing these exemptions during inspections





# PTE based on Tier standards

- > Tier standards are averages
  - ❖ “For direct compliance, the applicable emission [Tier] standard is specified by regulation based on the sales-weighted average rated power of all engines produced for the engine family” (CARB)
- > So, like an AP-42 factor, any particular engine may be below or above the Tier standard...*IF* it is ever tested
  - ❖ “While new stationary CI engines are certified...the regulation adopted not-to-exceed limits (NTE) that apply to these same engines while in-use. ...when required to test, owners and operators have to meet the NTE limits.” (EPA, O/O Guidance Doc for the NSPS for CI ICE, Section 1.0)
- > On the flip-side, the Tier standards for CO for small SI engines can be very large ( $10 \times$  AP-42 or more), making even single-digit HP engines look like major sources

# Determining applicability of rental engines

- > Changes in ownership and location do not constitute modifications
- > Thus, applicability (e.g., Tier) of any engine is based on when that engine was *first* ordered/installed
- > Rental companies need to keep track of each engine's pedigree
  - ❖ Where and when it has been operated
  - ❖ All modification and reconstruction determinations
- > Also, always get Certificates of Conformity for each NSPS engine

# No nameplate, specification sheet, or purchase record

## > Manufacture date dilemma

- ❖ Can you confidently say it is pre-2006?
  - ◆ If yes, call it existing
  - ◆ If no, you may have to call it new

## > Horsepower dilemma

- ❖ Can you quantify the fuel usage (gal/hr, cf/day)?
  - ◆ If yes, assume an efficiency (35% for SI and 40% for CI) to calculate power output
- ❖ Else, if the engine is powering an electric generator (with a known kW output)
  - ◆ Assume an efficiency of the generator (85%)

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## **Upcoming *Understanding Engines* courses:**

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**July 13, 2016 - Jacksonville, FL**

**August 24, 2016 - Oakland, CA**

**October 5, 2016 - Tulsa, OK**

**In 2017, Salt Lake City, Raleigh, and St. Louis**