

**RULE WORKSHOP**  
**for**  
**Stationary Internal Combustion Engines**

Proposed Rule 3.22

Proposed Date of Adoption: June 1, 2009

Feather River Air Quality Management District

April 16, 2009

# Workshop Overview

- Background
  - Criteria Pollutants
  - Federal and State Standards
- Rule 3.22 Emission Limits
- Emission Control Strategies
- Compliance Schedule and Testing
- Examples
- Questions

# Ground-level Ozone

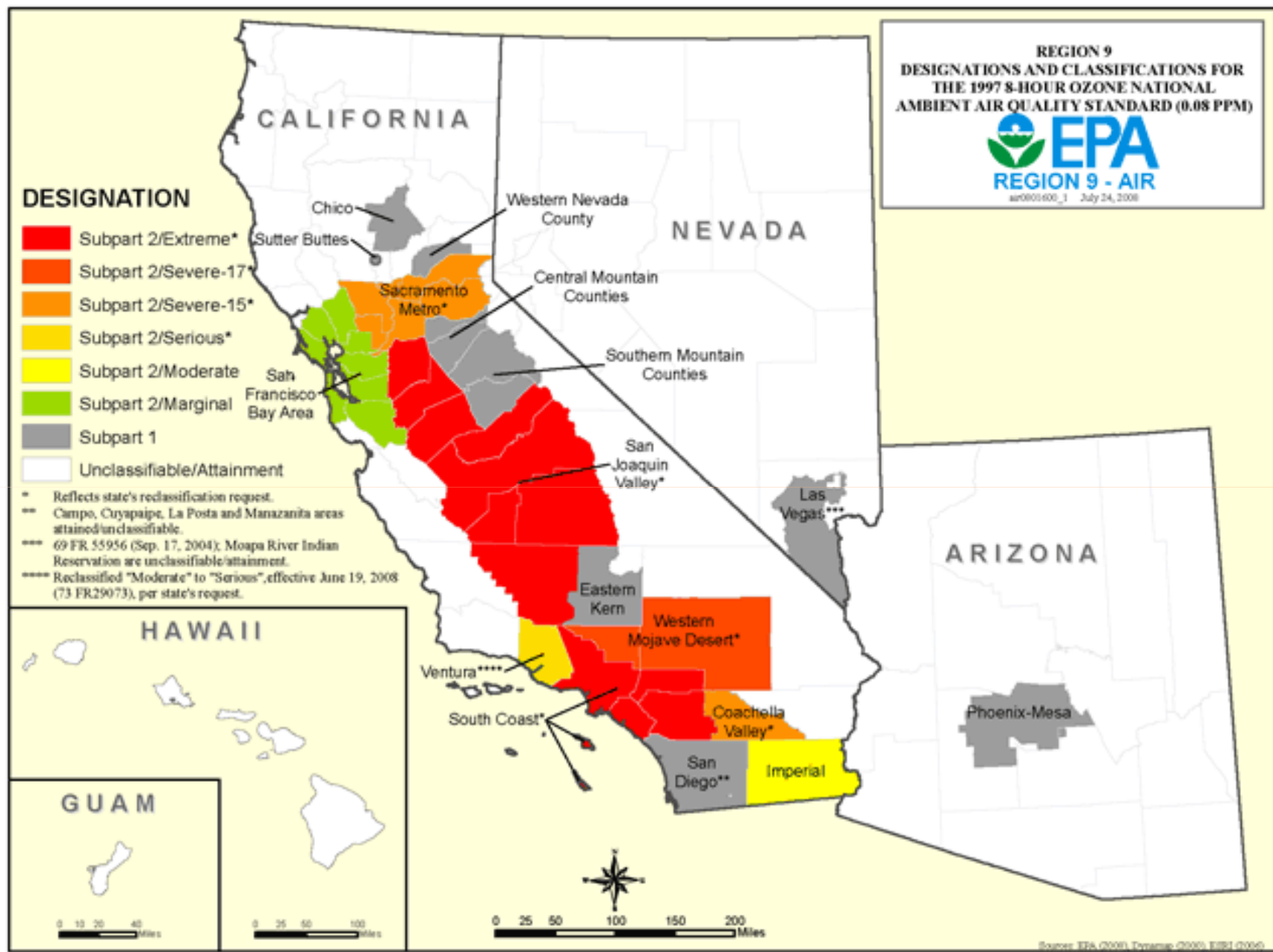
- **Formation**
  - Volatile Organic Compounds (VOCs) and Oxides of Nitrogen (NO<sub>x</sub>) react with sunlight to create ground level ozone
  - Ozone is highly reactive & strong irritant
  - Main component of smog
- **Health Effects**
  - Damages lung tissue through inhalation
  - May aggravate chronic respiratory symptoms and asthma
  - Irritates eyes, nose, and lungs
- **Other Damage**
  - Damages crops

# Particulate Matter

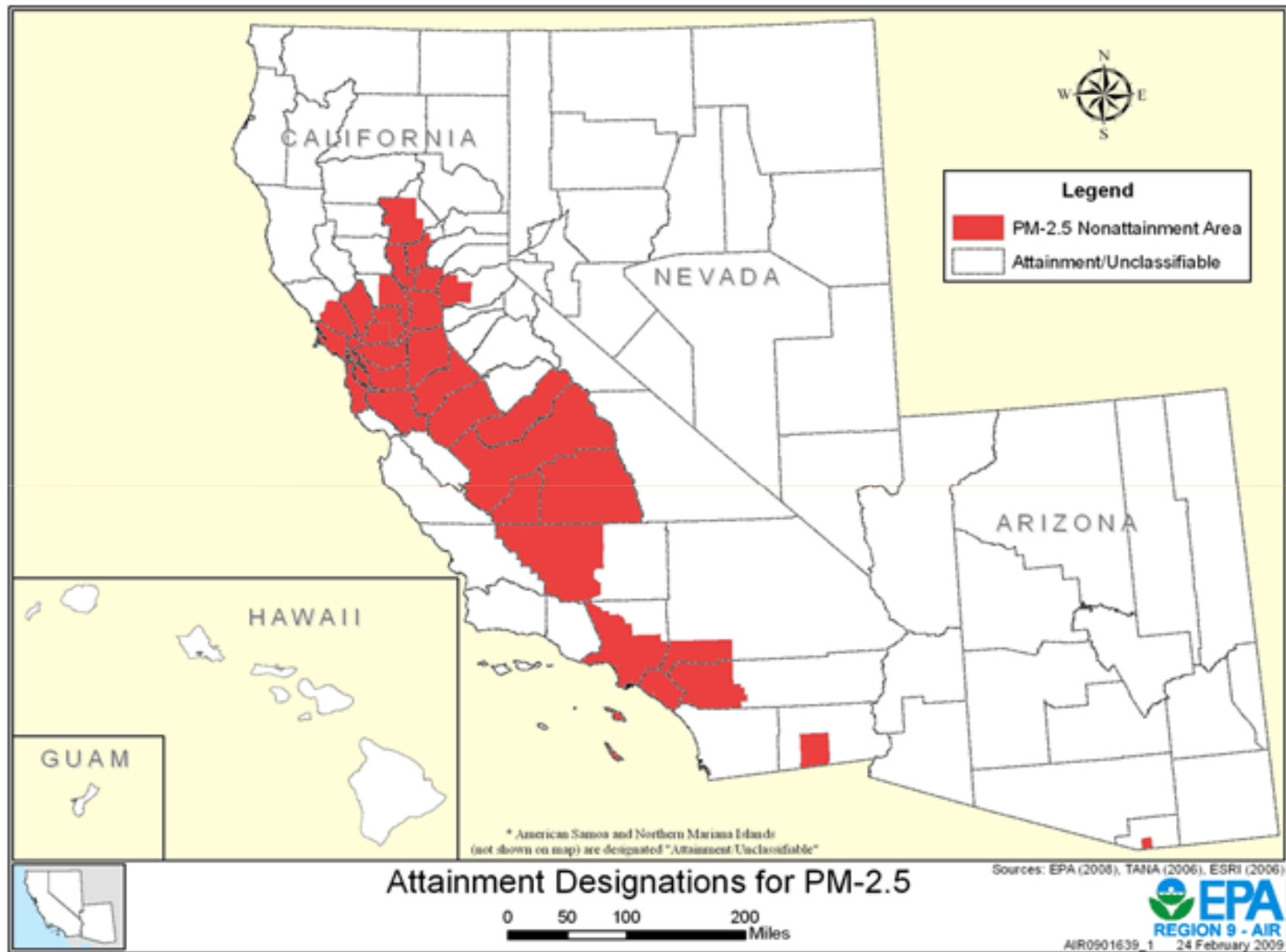
- **Very fine liquid and solid particles suspended in the air**
  - Smaller than 10 microns = PM10
  - Smaller than 2.5 microns = PM2.5
  - The average human hair is about 70 micrometers in diameter
- **Becomes entrained in the air due to:**
  - unpaved road dust
  - wood burning
  - motor vehicles
  - combustion sources ← Rule 3.22
- **Health Effects**
  - asthma attacks, pneumonia, and bronchitis

# Federal Requirements

- **Federal Clean Air Act of 1990**
  - “Severe” non-attainment for ozone in the southern portion of Sutter County (Sacramento Federal Non-attainment Area)
  - Non-attainment for the federal PM2.5 standard
  - Federal law and regulations set specific planning requirements to meet reasonable further progress goals and demonstrate attainment.
- **The State Implementation Plan (SIP)**
  - Contains a list of control measures which will help the area reach the attainment standard.
  - Achieve the ozone standard no later than 2018.
  - If we don’t reach attainment, we lose federal money for highways.



Non-attainment Districts for the Federal 8 hour Ozone Standard



Non-attainment Districts for the Federal PM 2.5 Standard

# State Requirements

- **California Clean Air Act (CCAA) of 1988**
  - “Requires non-attainment districts to meet the ozone standard by the earliest practical date by adopting “every feasible measure” (CH&S 40914)
  - Requires the use of Reasonably Available Control Technology (RACT) or Best Available Retrofit Control Technology (BARCT) for existing stationary sources (CH&S 40918 & 40919)
- **SB 656 of 2003**
  - Districts must adopt the most readily available, feasible, and cost effective control measures to reduce PM10 and PM2.5.



Non-attainment Districts for the State Ozone Standard

# Feasibility

- According to the California Air Resources Board (CARB), adopting all feasible measures involves adopting and implementing regulations that have been successfully implemented elsewhere
  - Shasta, Tehama, Butte, Colusa
  - Yolo-Solano, Placer, Sac-Metro
  - South Coast, Santa Barbara, SLO, Ventura, San Diego
  - San Joaquin, Bay Area
- Rule 3.22 is based on CARB's determination of RACT/BARCT for Stationary Internal Combustion Engines (11/2001)

# What does all this mean?

- **In layman's terms:**
  - Most of California is in non-attainment for ozone and PM.
  - The federal government has imposed deadlines to reach the health based air quality standards.
  - FRAQMD is obligated by the SIP to create rules at the District level to help reach attainment status.
  - **This rule will update the older, dirtier engines with new technology.**

# Rule 3.22 Requirements

- **Purpose:**
  - Limit NO<sub>x</sub> emissions from all stationary internal combustion engines.
  - PM<sub>10</sub> emissions will decrease with better combustion techniques.
- **Exemptions:**
  - Engines smaller than 50 horsepower
  - Emergency standby engines
  - Engines operating less than 200 hours per year
  - Portable engines
  - Agricultural engines

# North FRAQMD Emission Limitations

	<b>NO<sub>x</sub></b> (ppmv at 15% O <sub>2</sub> )	<b>VOC</b> (ppmv at 15% O <sub>2</sub> )	<b>CO</b> (ppmv at 15% O <sub>2</sub> )
<b>Spark Ignited Rich Burn</b>	<b>90</b>	<b>250</b>	<b>4000</b>
<b>Spark Ignited Lean Burn</b>	<b>150</b>	<b>750</b>	<b>4000</b>
<b>Compression Ignited</b>	<b>600</b>	<b>750</b>	<b>4000</b>

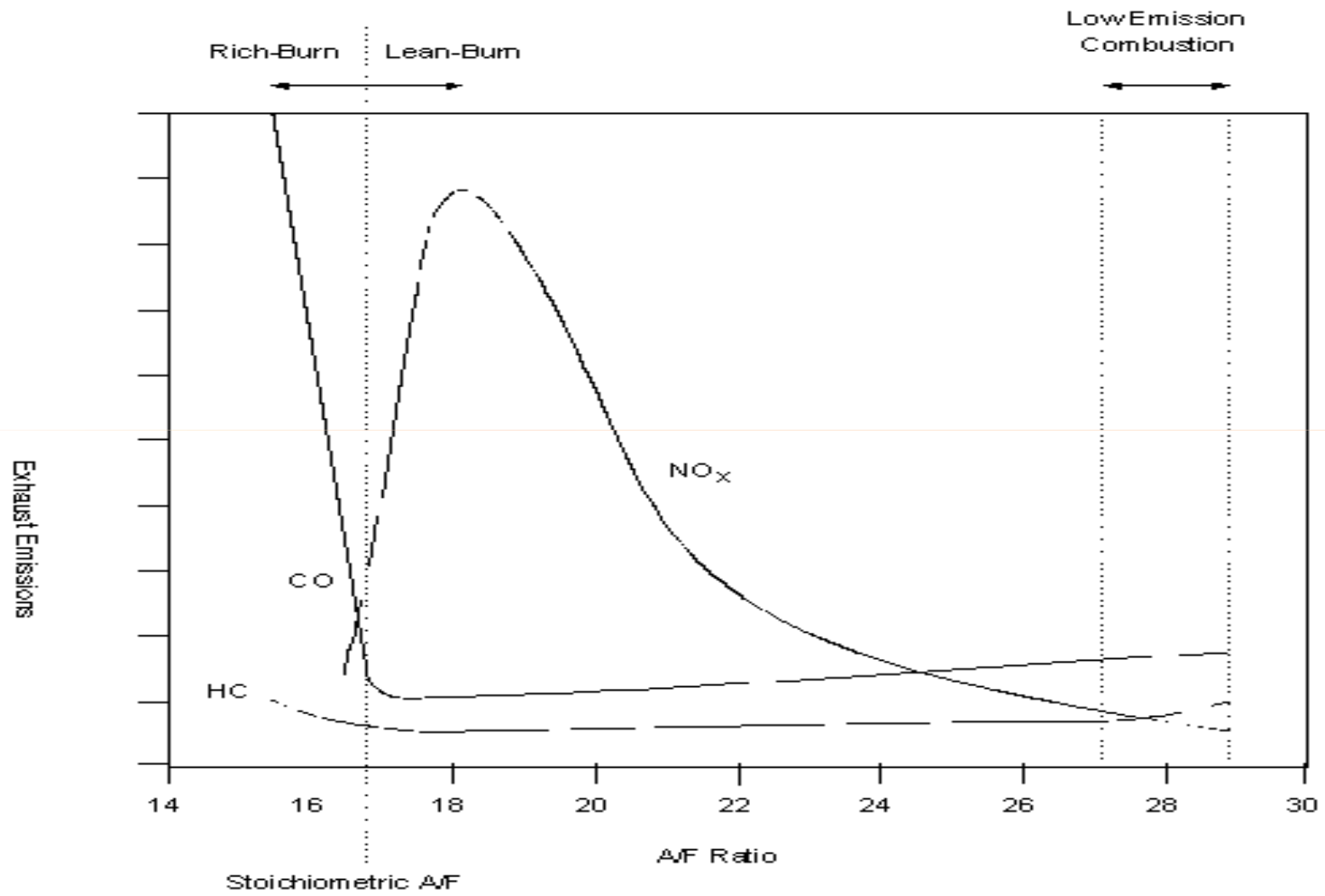
# South FRAQMD Emission Limitations

	<b>NO<sub>x</sub></b> (ppmv at 15% O <sub>2</sub> )	<b>VOC</b> (ppmv at 15% O <sub>2</sub> )	<b>CO</b> (ppmv at 15% O <sub>2</sub> )
<b>Spark Ignited Rich Burn</b>	<b>25</b>	<b>250</b>	<b>4000</b>
<b>Spark Ignited Lean Burn</b>	<b>65</b>	<b>750</b>	<b>4000</b>
<b>Compression Ignited</b>	<b>80</b>	<b>750</b>	<b>4000</b>

# Emission Control Strategies:

- **Lean**
  - The lower pressure and temperature reduces NO<sub>x</sub>. Increases VOCs and CO
  - Increases fuel efficiency, but lowers power output
- **Air/fuel ratio controller**
  - Stoichiometry is achieved when the air/fuel ratio is such that all the fuel can be fully oxidized with no residual oxygen remaining
- **Turbocharging and aftercooling**
  - Makes the combustion process more effective, which reduces emissions
- **Ignition system improvement**

# NATURAL GAS ENGINES



# Emission Control Strategies:

- **Non-Selective Catalytic Reduction (NSCR)**
  - Noble metal catalyst (platinum, rhodium, or palladium)
  - 3 way reduction, works on rich burn engines
    - $\text{VOCs} + \text{CO} \rightarrow \text{CO}_2 + \text{water}$ ;  $\text{NO}_x \rightarrow \text{N}_2$
- **Selective Catalytic Reduction (SCR)**
  - Ammonia or urea injection, works on lean burn & diesel engines
    - $\text{NH}_3 + \text{NO}_x \rightarrow \text{N}_2$  and water;
    - Must not use too much ammonia
- **Engine Replacement**
  - Add on controls can only reduce emissions so far
  - May be more cost effective to buy a new engine

# Initial Compliance

- Submit an Authority to Construct-Permit to Operate application to the District by: **June 1, 2010**
- Demonstrate initial compliance by: **June 1, 2011**
  - Conduct an official source test of the engine emissions
  - Another method approved by the APCO on a case-by-case basis
    - Submitting the results of previous source tests
    - Engine/Control Equipment emission certifications
      - 8,000 hours of operation

# On-going Compliance



- Source Test the engine at least once every **five years**
- During any year in which a source test is not performed, test with a portable NOx analyzer
- Fill out annual form demonstrating compliance.

# Source Test

- Schedule a company to perform it
- Submit a protocol to the District thirty days before the test
- Submit results to the District thirty days after the test



<http://www.arb.ca.gov/ba/icp/application/icpapp.htm>

# Portable NOx Analyzer



- Cheaper than a source test
- Lets the operator know if the engine is out of compliance
- The operator has 15 days to tune the engine back into compliance

<http://www.podtech.com/links/port-analyzer.html>

# Alternative Option:

## Going Electric

- Within 6 months after District adoption of this rule, submit a statement to the District identifying the engine to be removed
- Remove the engine and electrify the source no later than three (3) years after District adoption of this rule

# Example 1)

- Natural Gas compressor: CATERPILLAR Model G379NA engine, Model Year 1996, 330 bhp, rich burn, controlled by a Catalytic Converter
  - You believe the engine **can meet the emission limits.**
- What you do:
  - Submit A/C application by June 1, 2010, saying you'll source test the unit.
  - Have the engine source tested, showing compliance by June 1, 2011.

## Example 2)

- Natural Gas compressor: AJAX Model DPC-115 engine, Model Year 1993, 115 bhp, lean burn, no add-on controls
  - Based on your knowledge, you don't think the AJAX can meet the emission limits very easily.
  - **More cost effective to buy a new engine.**
- What you do:
  - Submit A/C application by June 1, 2010 for the replacement of the existing engine with a newer engine.
  - Have the existing engine removed by June 1, 2011.
  - The new engine must demonstrate initial compliance no later than 90 days after full installation.

## Example 3)

- Electric Generator: DETROIT DIESEL Model 6063TK35 engine, Model Year 1998, 490 bhp, compression ignition
  - Your facility chooses to **go electric** due to increased regulations on diesel engines
- What you do:
  - Submit a letter to the District by December 1, 2009, certifying you will electrify the source.
  - Submit A/C application a month before you remove the engine.
  - Have the engine removed and electrify the source by June 1, 2012.

# Final Words

- The need is apparent: comply with state and federal standards
- This rule is similar to the rules adopted by neighboring districts
- **This rule is the most cost effective approach to reduce emissions and reach attainment status**



# Comments

- Please submit formal comments in writing to:

Feather River Air Quality Management District

David Valler, APCO

938 14<sup>th</sup> Street

Marysville, CA 95901

- Written Comments are due by: **May 18, 2009**