United States Department of Agriculture
Natural Resources Conservation Service

Environmental Quality Incentive Program
California Air Quality

Emission Reductions from Replacing Engines
Fiscal Year 2011
Guidelines, Policies, and Procedures

Combustion Systems Improvement
(Code 372)

Emission reductions are achieved by improving existing high polluting combustion systems. This category can provide real emission reduction benefits by retiring the high polluting equipment earlier than through normal attrition and replacing with new, cleaner technology.

In 1998, the California Air Resources Board identified diesel particulate matter as a toxic air contaminant. Exposure to diesel emissions may result in negative health affects. Diesel emissions also include oxides of Nitrogen (NOx), a precursor to ozone in smog formation that has also been shown to cause adverse health affects. Cost-effective measures for reducing the toxic air contaminants and NOx emissions can be achieve with early replacement of older agricultural equipment.

Eligible Projects

Replacing high polluting, fully functional engines with newer reduced-emission engines meeting the most current model year California emissions standards.

Payments are available to replace an existing engine (engine repower) with a newer emissions certified engine instead of rebuilding the existing engine to its original specifications. The replaced equipment must perform a similar function as the old equipment.

Replacing an engine, however, may not always result in the best value. Replacing only the engine on equipment may not be possible due to design constraints or the diminished value of the old equipment may not justify investing significant funds for engine replacement. These situations will be evaluated on a case-by-case basis. If approved, payments will be made for the reductions achieved from equipment replaced with new emissions technology.

If repowering with an engine meeting the current applicable emission standard is technically unfeasible, unsafe, or cost-prohibitive to develop at the time funds are

obligated, then the engine must meet the most current practicable, previously applicable emission standard. The participant must submit a written statement of reason provided by the engine manufacturer verifying that a particular piece of equipment cannot accommodate an engine meeting current specifications without major modifications, safety risks, exorbitant costs, or for which engine or equipment models for repowers are not available or feasible.

The replacement engine and equipment must be certified for sale in California and meet the most recent model year emission standards and/or emissions standards established by the local APCD or AQMD, if applicable. Once in operation, the engine and equipment must be used exclusively in California.

Significant air quality benefits can result if two or more engines are replaced with a single engine performing similar duties. Eligibility will be evaluated on a case-by-case basis by examining the estimated emission reductions and cost effectiveness.

The upgrading or installation of fueling stations and infrastructure is not eligible, including the expense of installing fuel storage tanks, construction of fueling depots, or construction of biodiesel manufacturing facilities.

Retrofits to an engine are eligible. A retrofit is the installation of an emission control system verified by the ARB, such as diesel particulate filters, diesel oxidation catalysts, or selective catalyst reduction systems. Retrofit technology may be installed on an existing engine that results in meeting current emission standards or on a new engine that results in additional emission reductions.

The existing engine or equipment being replaced must be owned by the participant, have been used in the State of California for at least 12 months prior to the application submittal date, have some remaining life, and must be destroyed.

Soon after being replaced, the old, existing engine and equipment (if applicable) must be destroyed. Destruction of the old engine and equipment permanently removes the existing, high emitting equipment from service and ensures that the emission reductions are real. It also prevents the existing equipment from being moved into another locale to continue emitting high levels of pollutants. The participant must therefore certify that the old equipment has been destroyed and rendered useless.

NRCS payments schedules are available and vary depending on the type and size of the new engine or equipment.

A minimum two-year contract period is required. The participant must initiate the project within the first year of the contract. Payment is initiated once all contract obligations are met.

Section 1: Definitions

Add-On Control Device: an air pollution control device, such as catalytic converter, that reduces the pollution in exhaust gas. The control device usually does not affect the process being controlled and thus is "add-on" technology, as opposed to a scheme to control pollution through altering the basic process itself.

Ambient Air Quality Standards (AAQS): National and State health- and welfare-based standards for outdoor air, which identify the maximum acceptable average concentrations of air pollutants during a specified period of time. A chart of the national and state AAQS is posted on-line at: www.arb.ca.gov/research/aaqs/aaqs2.pdf.

ARB: the State of California Air Resources Board.

Brake Horsepower (bhp): the measure of an engine's horsepower without the loss in power caused by the gearbox, generator, differential, water pump, and other auxiliary components that may slow down the actual speed of the engine. For Practice Code 372, the engine horsepower determination is based on the Rated Brake Horsepower.

Certified Compression-Ignited Engine: a Tier 1, Tier 2, Tier 3, Tier 4-Interim, and Tier 4-Final compression-ignited engine certified by the EPA and/or the ARB. Tier schedule is on Table 1.

Certified Spark-Ignited Engine: a spark-ignited engine that is ARB-certified as specified in Title 13, Division 3, Chapter 9, Article 4.5, Section 2433 of the California Code of Regulations.

CIG (b) Eligible Counties: counties or areas within counties designated by the EPA as "nonattainment" of the NAAQS for a given pollutant are eligible for CIG (b) funding. These counties are: Alameda, Butte, Calaveras, Contra Costa, El Dorado, Fresno, Imperial, Inyo, Kern, Kings, Los Angeles, Madera, Mariposa, Marin, Merced, Nevada, Mono, Napa, Orange, Placer, Riverside, San Bernardino, San Diego, San Joaquin, San Mateo, Santa Clara, Sonoma, Stanislaus, Sutter, Tulare, Tuolumne, Ventura, Yolo, and Yuba.

Compression-Ignited Internal Combustion Engine: an engine that uses the heat of compression to initiate combustion.

Criteria Air Pollutant: derived from EPA, an air pollutant for which acceptable levels of exposure can be determined and an ambient air quality standard has been established, based on the pollutant's characteristics and potential health and welfare effects. These pollutants include ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter (PM10 and PM2.5), and lead.

Diesel Engine: a compression-ignited internal combustion engine.

Diesel Exhaust Particulate Matter: the ARB designates diesel exhaust particulate matter as a toxic air contaminant (TAC) based on its potential to cause cancer, premature death, and other health problems. As a result, the ARB established several Airborne Toxic Control Measures (ATCM's) that are codified in the California Code of Regulations. The ATCM's establish emission standards to reduce diesel exhaust particulate matter and health risks. Diesel exhaust particulate matter ATCM's are posted on-line at: www.arb.ca.gov/toxics/atcm/atcm.htm.

Drawbar Horsepower: is the power an agricultural tractor has to pull an implement. The power is determined by utilizing a special a dynamometer car coupled behind a tractor that keeps a continuous record of the drawbar pull exerted and the speed. For Practice Code 372, drawbar horsepower will not be used for comparison with rated break horsepower because this value varies under different operating conditions and does not necessarily correlate with the engine horsepower.

Emergency Standby Engine: a stationary engine where the primary purpose is to provide electrical or mechanical power in an emergency and operate to provide electrical power or mechanical work during an emergency use. Limited non-emergency use may occur for maintenance and testing purposes, impending outages, or under a Demand Response Program administered by a utility.

Emission Control System: any device or system employed with engines or piece of equipment that is intended to reduce emissions. Examples of emission control systems include, but are not limited to, closed-loop fuel control systems, three-way catalysts, fuel injection systems, and combinations of the above.

Engine Repower: the replacement of an existing engine with a new, emissions certified engine instead of rebuilding the existing engine to its original specifications.

EPA: The United States Environmental Protection Agency.

Family Emission Limit (FEL): an emission level declared by the manufacturer for use in any averaging, banking and trading program and in lieu of an emission standard for certification. It serves as the applicable emission standard for determining compliance of any engine within an engine family under 13 California Code of Regulations Sections 2423 and 2327. Any ARB Executive Order reporting a FEL value exceeding an applicable NOx, NMHC+NOx, CO or PM emission standard is not eligible for NRCS payments. Only FEL values less than or equal to these emission standards are eligible.

Forklift: Applicability to this practice standard includes electric Class 1 or 2 rider trucks, large spark-ignition engine powered Class 4, 5 or 6 rider trucks, and Class 7 rough terrain forklifts as defined by the Industrial Truck Association and Occupational

Safety and Health Administration (OSHA). Electric Class 3 trucks are not forklifts for the purposes of this practice standard.

Gross Horsepower (ghp): for purposes of Practice Code 372, the maximum gross horsepower equals the rated break horsepower only when bhp information is not available.

Gaseous Fuel: a fuel that is a gas under standard conditions, including but not limited to: natural gas, methane, propane, butane, bio-gas, and liquefied petroleum gas (LPG).

Independent Source Test Contractor: a program administered by the ARB that approves private independent source testing contractors to conduct required compliance emissions verification testing. Source operators may select from a list of contractors. The ARB does not require that testing contractors be approved prior to conducting testing in California; however, approval is required if the contractor wishes to conduct source testing for compliance verification. A list of contractors is available at: www.arb.ca.gov/ba/icp/current.pdf.

Internal Combustion (IC) Engine: any spark- or compression-ignited reciprocating engine.

Lean-Burn Engine: an engine operated with an exhaust stream oxygen concentration of four percent by volume or greater. Mechanically, such engines may be equipped with turbochargers.

Mobile Source Certification: new motor vehicles and engines are certified by the ARB for emission compliance before they are legal for sale, use, or registration in California. Certification is granted annually to individual engine families and valid for one model year. Certifications are described through ARB Executive Orders, which are posted on-line at: www.arb.ca.gov/msprog/offroad/cert/cert.php

Nonattainment Area: a geographic area identified by the EPA and/or the ARB as not meeting either National AAQS and/or California AAQS standards for a given pollutant, respectively.

Non-Methane Hydrocarbon (NMHC): The sum of all hydrocarbon air pollutants except methane.

NOx: a general designation pertaining to compounds of nitric oxide (NO), nitrogen dioxide (NO_2) and other oxides of nitrogen. NOx is typically created during the combustion processes and are major contributors to ozone formation and acid deposition. NO_2 causes adverse health affects, is a criteria air pollutant and a major component in smog formation. This designation does not include nitrous oxide (N_2O), which is designated as a greenhouse gas.

Off-Road Compression-Ignition Equipment: Equipment that cannot be registered and driven safely on a road or was not designed to be driven on a road. Newer equipment uses engines certified by the ARB to the off-road compression-ignition or diesel engine standards. Such equipment is most commonly used in construction, mining, agriculture, and cargo handling equipment. These engines do not include engines at operating at stationary agricultural pump plants.

Off-Road Spark-Ignited Equipment: equipment that cannot be registered and driven safely on-road or was not designed to be driven on-road. Newer equipment uses engines certified by the ARB to the off-road spark ignition engine standards. These engines may be designed to use gasoline fuel, liquid petroleum gas (LPG), compressed natural gas, methanol fuel, or a combination of these.

Ozone: a form of molecular oxygen that consists of three oxygen atoms linked together (O_3). Ozone in the upper atmosphere occurs naturally and protects life on earth by filtering out ultraviolet radiation from the sun. However, ozone at ground level is a noxious pollutant that causes numerous adverse health affects, is a criteria pollutant and the major component of smog. Ozone is not emitted directly, but is formed in the atmosphere through a complex chemical reaction involving hydrocarbons, oxides of nitrogen, and sunlight. Problematic ozone levels occur most frequently on hot summer afternoons.

Ozone Precursors: chemicals involving reactive hydrocarbons and oxides of nitrogen, occurring either naturally or as a result of human activities, contribute to the formation of ozone.

PM: a general designation pertaining to particulate matter emissions. PM2.5 has an aerodynamic diameter equal to or less than 2.5 microns and PM10 has an aerodynamic diameter equal to or less than 10 microns as measured by the applicable State and Federal reference test methods. Their small size allows them to make their way to the air sacs deep within the lungs where they may be deposited, resulting in adverse health affects. PM also causes visibility reduction and contributes to regional haze.

PTO Horsepower: is the “usable” horsepower measurement at the power take-off (PTO) shaft’s output and is the power for tractor attachments. For purposes of Practice Code 372, multiply the PTO horsepower value by 1.15 if the rated break horsepower or gross horsepower information is not available for an existing engine. This value will be used for comparison with the rated brake horsepower of a new, replacement engine.

Rated Brake Horsepower: the continuous brake horsepower rating specified for the engine by the manufacturer or listed on the nameplate of the unit without regard to any de-rating or modification. For Practice Code 372, this value is the basis for engine rated horsepower.

Retrofit: the installation of an ARB-verified emission control system on an existing engine. Examples include, but are not limited to, diesel particulate filters and catalyst systems on spark-ignited engines. Verified technologies for diesel engines are posted on-line at: www.arb.ca.gov/diesel/verdev/vt/cvt.htm.

Rebuilt or remanufactured: engines offered by the original engine manufacturer (OEM) or by a non-OEM rebuilder who demonstrates to the ARB that the rebuilt engine and parts are functionally equivalent from an emissions and durability standpoint to the OEM engine and components being replaced.

Reactive Organic Gas (ROG): sometimes referred to as non-methane hydrocarbons (NMHC), a photo-chemically reactive chemical gas composed of non-methane hydrocarbons that may contribute to ozone formation.

Rich-Burn Engine: an engine operated with an exhaust stream oxygen concentration of less than four percent by volume. Mechanically are naturally-aspirated engines.

Rough Terrain Forklift: Class VII forklifts powered by compression-ignition engines and equipped with pneumatic tires that handle uneven surfaces. Such forklifts include straight-mast and extended-reach forklifts.

Spark-Ignited Internal Combustion Engine: a liquid or gaseous fueled engine designed to ignite its air/fuel mixture by a spark across a spark plug.

Tier 1, Tier 2, Tier 3, and Tier 4 Engines (See Table 1 for the applicable Tier schedule):

(1) an EPA-certified compression-ignited engine that meets the Tier 1, Tier 2, or Tier 3 emission standards of Table 1 on page 56970 of the Final Rule (October 23, 1998) or the Tier 4 emission standards of Table II.A.2 (Tier 4 NOx and NMHC Standards and Schedule) on page 38971 of the Final Rule (June 29, 2004) or Table II.A.4 (Tier 4 Standards for Engines Over 750 HP (G/BHP-HR)) on page 38980 of the Final Rule (June 29, 2004), respectively.

(2) An ARB-certified compression-ignited engine that meets the standards according to Title 13, Section 2423(b)(1)(A) and/or Title 40, CFR, Part 89.112(a) of the California Code of Regulations. Tier 4 engines that are subject to the interim or final after-treatment based Tier 4 emission standards in Title 13, Section 2423(b)(1)(B) and/or Title 40, Part 1039.101 of the California Code of Regulations. This also includes engines certified under the averaging, banking, and trading program with respect to the Tier 1, 2, and 3 Family Emission Limits (FEL) listed in Title 13, Section 2423(b)(2)(A) and/or Title 40, Part 89.112(d) of the California Code of Regulations and to the Tier 4 FEL listed in Title 13 Section 2423(b)(2)(B) and/or Title 40, Part 1039.101 of the California Code of Regulations

Toxic Air Contaminant (TAC): an air pollutant, identified in regulation that may cause or contribute to an increase in deaths or in serious illness, or which may pose a present or potential hazard to human health. TACs are considered under a different regulatory process than that of criteria pollutants.

Uncontrolled Compression-Ignition Engine: also referred to as "Tier 0", is any diesel engine not meeting any established Tier emission standard. Generally, these are engines manufactured:

1999 and earlier: >750 hp
1998 and earlier: 25-49 hp
1997 and earlier: 50-99 hp
1996 and earlier: 100-174 hp
1995 and earlier: 175-750 hp

Volatile Organic Compounds (VOCs): many definitions describe VOCs, but are primarily organic, carbon-containing compounds having high enough vapor pressure under normal conditions to vaporize into the atmosphere. VOCs defined in a legal or regulatory concept are carbon compounds that contribute to the formation of ozone, as many VOCs are exempt from regulation. For example, methane is a VOC that does not contribute to the formation of ozone, but is designated a greenhouse gas. VOCs by themselves may also be classified as toxic air contaminants (TAC's). Other terminology describing the photo-reactivity of VOC includes Non-Methane hydrocarbons (NMHC); Reactive Organic Gases (ROG); and Total Organic Gases (TOG).

Section 2: Stationary Heavy-Duty Engines

This category primarily refers to stationary (i.e. bolted to a foundation or concrete slab) or portable (i.e. mounted on a trailer or skid, but does not drive a vehicle) engines. For purpose of Practice Code 372, this section may also include auxiliary engines on mobile equipment provided that the auxiliary engine does not propel a vehicle. This section does not apply to any off-road or mobile equipment (such as a tractor powering an irrigation gear head or pump via a PTO). The majority of stationary heavy-duty engines used in agriculture are used for crop irrigation.

The California Air Resource Board (ARB) established emission standards and requirements that regulate the sale, purchase, rental, lease, and operation of diesel engines, including stationary and portable equipment used exclusively in agriculture. In addition, an Air Pollution Control District (APCD) or Air Quality Management District (AQMD) may impose emission standards through a rule or require permits with emission limits that may be more restrictive than required by the ARB. It is recommended for the participant to first consult with the local APCD or AQMD to determine permitting and emissions requirements prior to seeking assistance from the NRCS.

Several California air districts and the Air Resources Board have established compliance deadlines phasing-out the continued use of older stationary engines, including uncontrolled (Tier 0) diesel engines. Once a deadline has passed, no emission reductions are achieved with replacing subject engines since they are no longer allowed to operate.

Program Requirements

New Installations, producers are encouraged to install new electric motors or electric technology in lieu of installing internal combustion engines.

Existing Engines:

A) Existing engines must be in operational condition and connected to the equipment it powers.

B) Outfitted with an uncontrolled (Tier 0), Tier 1- or Tier 2-certified diesel engine and repowered with one of the following:

- A new electric motor; or
- A new off-road Tier-certified diesel engine meeting the most current model year ARB/EPA emission standards or local air district emission and permitting requirements (as applicable).

C) Outfitted with an emissions-controlled spark-ignited engine and repowered with one of the following:

- A new electric motor, or
- A new spark-ignited engine certified to the current ARB applicable emission standards or local air district emission and permitting requirements (as applicable).

D) Spark-ignited engines may operate on gaseous fuels, gasoline, or renewable fuels. Existing spark-ignited engines cannot be replaced with new diesel engines.

E) The existing engine must be rated at 50 bhp or more, situated at its operational location (wellhead or booster trailer), and in operational condition. Engines rated at less than 50 bhp are not eligible.

F) The participant must own and operate the existing equipment in California for at least the past 12 months.

G) The participant must complete the supplemental application form that includes the existing engine manufacturer, fuel-type, model year, serial number.

H) Unless specifically exempted, uncontrolled (Tier 0) diesel stationary engines are no longer permitted to operate in California. Any proposed project replacing an existing Tier 0 engine will not result in surplus emission reductions.

Replacement Engines:

A) The new replacement engine is rated at least 50 horsepower (37 kilowatts).

B) The new electric motor is rated at least 25 horsepower (19 kilowatts).

C) The new replacement engine and equipment must be a new Original Equipment Manufacturer (OEM) engine certified by the ARB for sale in California, certified for the current model year standards, and meet the most recent model year emission standards and/or emissions standards established by the local APCD or AQMD, as applicable. Once in operation, the engine and equipment must be used exclusively in California.

D) ARB Executive Orders for certified off-road engines are posted on the Internet at: www.arb.ca.gov/msprog/offroad/cert/cert/php.

E) Engines where an ARB Executive Order specifies a Family Emission Limit (FEL) that exceeds the applicable emission standards are not eligible for NRCS payments. Only FEL values lower than these emission standards are eligible.

F) Spark-ignited engines must meet or exceed the applicable emission standards established by the ARB or local APCD or AQMD.

G) Installing a new electric motor rated at 25 hp (19 kilowatts) or more in lieu of an internal combustion engine is eligible for payments and encouraged. The applicant must provide information whether an adequate electric power supply is at the site or provide documentation from the local utility company for power installation.

H) The horsepower rating of the replacement equipment engine must be within 125% of the original manufacturer rated bhp (baseline) for the old equipment engine. If the horsepower rating of the new engine is greater than 125% of the existing engine, the participant must provide sufficient information for the increase in horsepower that will be evaluated on a case-by-case basis. If the information provided is not approved, the maximum eligible payment may be capped at the horsepower level of the existing engine and not the new engine.

I) IC engines or electric motors installed at pumping plants must adhere to Practice Code 533, Pumping Plant guidelines, where applicable. An engineering analysis may be required.

J) The replacement engine must report at least a 15% NOx reduction and no increase in particulate matter emissions, compared with the applicable standards or emission levels for that engine year and type of application through ARB Certification Testing, EPA Certification Testing, or emissions testing at a laboratory approved by the EPA or ARB.

K) Have an approved Authority to Construct from the local APCD or AQMD prior to installation, if a permit is required.

L) An APCD or AQMD may require an emissions source test on the new engine depending on the conditions specified on an applicable Authority to Construct or Permit to Operate. Source testing using accepted testing protocols must be completed by an ARB-certified independent contractor to the satisfaction of the APCD or AQMD before payments will be provided. A list of approved independent contractors is posted on the Internet at: www.arb.ca.gov/ba/icp/current.pdf

M) The participant is advised to maintain a record of new equipment usage for at least the first five years of operation. Hours of operation may be accomplished by recording the readings from a fully operational hour meter at the beginning and end of each year.

N) For emissions calculations and cost effectiveness purposes, the project life is 10 years.

Retrofits

Retrofit projects must install ARB-verified emission control systems meeting the following minimum standards:

A) For an uncontrolled diesel engine, the retrofit kit that must be verified to reduce NOx or NOx+NMHC (non-methane hydrocarbons) emissions to the applicable current Tier standard for a given engine type and size.

B) For an uncontrolled spark-ignited engine, the retrofit kit must be verified to reduce NOx+NMHC emissions to the currently applicable standards for spark-ignited engines.

C) For an emission-certified (1996+ model year) diesel engine, the retrofit kit must be verified to reduce NOx or NOx+NMHC emissions by at least 15% from the applicable NOx or NOx+NMHC emission standard.

D) The retrofit kit to reduce PM must use the highest level ARB-verified technology available for the engine being retrofitted.

A complete list of ARB-verified retrofits may be found via the Internet at: http://www.arb.ca.gov/diesel/verdev/verdev.htm.

Section 3: Mobile Off-Road Agricultural Equipment

Equipment in this category includes: tractors, bailers, harvesters, combines, loaders, forklifts, and other agricultural off-road support equipment. These engines provide power to self-propel a vehicle and do not include portable engines, auxiliary engines on mobile equipment, and on-road mobile equipment.

Program Requirements

Existing Equipment:

A) The existing equipment is in operational condition to qualify. At a minimum:

(1) The tires are in usable condition (able to hold air, sufficient tread, etc.)
(2) Steering is operational
(3) The equipment is able to start-up and move backwards and forwards
(4) Buckets, blades, hydraulics, rollers, etc. are in working order
(5) Undercarriage is structurally sound
(6) Fuel tank is in usable condition
(7) No parts have been stripped
(8) Equipment has not been vandalized

B) The existing engine must be rated at 50 or more bhp and operated in California for at least the past 12-months.

C) **Engine Repowers:** Mobile off-road agricultural equipment outfitted with:

(1) An uncontrolled (Tier 0), a Tier 1-, or a Tier 2-certified diesel engine and repowered with a new off-road Tier-certified diesel engine meeting the most current model year ARB/EPA emission standards; or

(2) A spark-ignited engine and repowered with a new spark-ignited engine certified to the current ARB emission standards. Existing equipment outfitted with spark-ignited engines cannot be replaced with new diesel-powered engines.

D) **Equipment Replacement:** Consultation with the equipment vendor and/or manufacturer may determine that certain equipment cannot accommodate an engine repower without performing major modifications, safety risks, or exorbitant costs. Where an engine repower is deemed infeasible, projects will apply to replacing mobile off-road agricultural equipment. Eligible projects are:

(1) Equipment outfitted with an uncontrolled (Tier 0), a Tier 1-, or a Tier 2-certified diesel engine is replaced with equipment outfitted with the latest current model year Tier-certified diesel engine.

(2) Existing forklifts equipped with internal combustion engines is replaced with electric-powered forklifts. Does not include electric hand carts, as these are not forklifts. Replacing with a new forklift equipped with an IC engine is not eligible under equipment replacement.

Replacement:

A) The replaced engine shall be rated at least 50 bhp.

B) The new replaced engine and equipment must be a new Original Equipment Manufacturer (OEM) engine certified by the ARB for sale in California, certified for the current model year standards, and meet the most recent model year emission standards and/or emissions standards established by the local APCD or AQMD, as applicable. Once in operation, the engine and equipment must be used exclusively in agriculture within California.

C) California Air Resources Board Executive Orders for certified off-road engines are posted on the Internet at http://www.arb.ca.gov/msprog/offroad/cert/cert/php.

D) Engines where an ARB Executive Order specifies a Family Emission Limit (FEL) that exceeds the applicable emission standards are not eligible for NRCS payments. Only FEL values lower than the emission standards are eligible.

E) An engine repower may include a new Original Equipment Manufactured (OEM) remanufactured, or an ARB certified/recertified rebuilt off-road engine meeting the latest California emission standards.

F) Spark-ignition engines must meet the application emission standards established by the ARB.

G) Replacement equipment must serve the same function and perform the same work equivalent as the existing equipment. Examples include:

(1) Replacing a loader with another loader or a tractor for another tractor; or,

(2) Replacing different types of equipment that will perform similar functions, improve operations efficiency, and reduce emissions (such as replacing a tracked dozer used for disking with a wheeled tractor that will perform the same work).

This requirement may be waived on a case-by-case basis where general purpose farming equipment changes commodities.

H) The horsepower rating for the new, replacement equipment engine shall not be greater than 125% of the original manufacturer rated brake horsepower (baseline) for the existing equipment engine. In limited situations, this

requirement may be waived if the horsepower increase results in significant annual emission reductions. The participant must document that the replacement equipment will serve the same function and perform the same job as the old equipment. Requests for waivers will be evaluated on a case-by-case basis for the following:

(1) The original horsepower range is not available for the existing engine.

(2) The higher horsepower is required where the existing equipment is replaced by another type of equipment that will perform the same work, improve operations efficiency, and reduce emissions (i.e. tracked dozer to wheeled tractor for disking).

(3) The higher horsepower replacement equipment is the result of implementing a conservation system.

I) Equipment is in new condition, has not been sold or associated with any rental or lease agreement, and has less than 100 operating hours recorded on a permanently mounted non-resettable hour meter.

J) The replacement engine must report at least a 15% NOx reduction and no net increase in particulate matter emissions, compared with the applicable standards or emission levels for that engine year and type of application through ARB Certification Testing, EPA Certification Testing, or emissions testing at a laboratory approved by the EPA or ARB.

K) The participant is to maintain a record of new engine and equipment usage for at least the first five years of operation. Hours of operation may be accomplished by recording the readings from a fully operational hour meter at the beginning and end of each year.

L) For electric equipment, the participant must include a description whether battery chargers have been installed. If not, the participant should describe the number of the battery chargers to be installed.

M) At this time, replacement with zero-emissions equipment other than electric (i.e. fuel cell equipment) is not eligible for payments.

N) For emissions calculations and cost effectiveness purposes, the project life is 10 years.

Replacing Multiple Existing-Equipment for New Equipment ("Two for One"):

Significant air quality benefits can result if the new equipment is replacing two or more existing equipment. All existing and new equipment must meet the eligibility requirements and are reviewed on a case-by-case basis. Replacing multiple equipment

units with one new unit is not intended as a means to increase the horsepower rating determination for the new engine or equipment, as any increase in horsepower of the new engine is limited to 125% of the baseline horsepower rating of the existing engine. The intent is to allow for additional emission reduction benefits by permanently retiring additional equipment earlier than through normal attrition, which might improve the final ranking scores for application prioritization.

A) The emission benefits are determined by subtracting the annual emissions from the new replacement engine from the sum of the annual emissions from all subject existing engines.

B) At a minimum, the new equipment must serve the same function and perform similar work as one of the existing equipment in order to be eligible. The other existing equipment may not necessarily be similar in type and functionality of the new equipment. The summed emission reductions (not the summed hp) will be used for ranking purposes. Examples include the following:

(1) An existing 92 hp 1979 tractor that operates 500 hours/year is retired for a new 105 hp Tier 3 tractor. In addition, a 150 hp 1985 loader that operates 800 hours/year will be retired. In this example, the 92 hp tractor is used as the baseline hp rating (i.e. like for like), limiting the maximum hp rating of the new equipment to 115 hp (125% of 92 hp). The NOx emission reductions are:

Sum of existing engine emissions = 1.17 tons NOx/yr
1979: 0.43 tons = {(92 hp x 12.09 g/bhp-hr x 500 hrs/yr x 0.70)/907,200}
1985: 0.74 tons = {(150 hp x 10.23 g/bhp-hr x 800 hrs/yr x 0.55)/907,200}

New engine emissions = 0.11 tons NOx/yr
Tier 3: 0.11 tons = {(105 hp x 2.74 g/bhp-hr x 500 hrs/yr x 0.70)/907,200}

Total NOx emission reductions = 1.06 tons/yr (91% NOx reduction)

(2) An existing 152 hp 1981 loader and an existing 125 hp 1975 loader will be retired for a new 160 hp Tier 4 Interim loader. In this example, despite which equipment is directly replaced with the new, the maximum hp of the two like equipment may be used as the baseline hp rating, thus limiting the maximum hp rating of the new equipment to 190 hp. As with example number one, the new engine emissions will be subtracted from the sum of the existing engine emissions to calculate the emission reductions.

C) A single piece of equipment may utilize more than a single engine mounted on the unit. Such equipment are equipped with multiple engines that operate together to perform a single function or task (i.e. a PTO on a self-propelled engine plus an auxiliary engine). The horsepower from each engine may be summed to determine the overall existing horsepower baseline and the emission

reductions. However, hours of operations for each engine may not be summed since multiple engines generally work together. The total emissions calculated from each engine may be summed. The maximum horsepower ratings for the new replacement equipment shall not exceed 125% of the summed horsepower of the existing equipment.

D) All existing engines and equipment used to achieve the additional emission benefits must be destroyed.

Retrofits

Retrofit projects must install ARB-verified emission control systems meeting the following minimum standards:

A) For an uncontrolled diesel engine, the retrofit kit that must be verified to reduce NOx or NOx+NMHC (non-methane hydrocarbons) emissions to the applicable current Tier standard for a given engine type and size.

B) For an emission-certified (1996+ model year) diesel engine, the retrofit kit must be verified to reduce NOx or NOx+NMHC emissions by at least 15% from the applicable NOx or NOx+NMHC emission standard.

C) The retrofit kit to reduce PM must use the highest level ARB-verified technology available for the engine being retrofitted.

A complete list of ARB-verified retrofits may be found via the Internet at: http://www.arb.ca.gov/diesel/verdev/verdev.htm.

Section 4: Engine and Equipment Destruction

Engine and equipment destruction must be performed in a safe manner that avoids any risks to personal safety.

Personal Safety always comes first.

After being replaced, the existing engine and mobile off-road agricultural equipment must be destroyed. Destruction removes the existing high-emitting engines and equipment from service and ensures that the emission reductions are real and permanent. It also prevents the old engine and equipment from being rebuilt or moved into another locale to continue emitting high levels of pollutants. Therefore, destruction includes the engine, drive-train and vehicle structural components, which shall not be recycled to be used as parts where they may prolong the life of other engines or vehicles, or used to rebuild equipment for continued use.

Under certain circumstances, an existing Tier 2-certified diesel engine may be relocated and used to replace an uncontrolled Tier 0 or Tier 1-certified diesel engine. The replaced existing engine and equipment must then be destroyed.

Procedures for disabling and rendering engines and equipment permanently inoperable:

(A) Prior to disabling the engine and equipment, the existing engine and equipment must be in operable working condition.

(B) After being replaced, the existing engine must be physically disabled in such a manner to eliminate the possibility of future use. At a minimum, the old engine block must be punctured with at least a six inch diameter hole to include a portion of the oil pan rail (sealing surface).

(C) The structural components on mobile equipment must be physically compromised. At a minimum, this shall be accomplished by cutting the vehicle frame railings in half or by destroying bell-housing and transmission components if not equipped with a frame.

(D) The disabled engine and equipment shall be properly disposed of at a dismantling facility approved by the NRCS. The approved dismantler will scrap the engine and equipment either by shearing, crushing, or shredding.

(E) The producer shall provide the NRCS with a written certification that the engine and associated equipment has been permanently destroyed. If destruction was performed by an approved dismantler, the dismantler will provide the producer with the written certification for submittal to the NRCS. The certification shall describe:

- The existing engine and equipment type,
- The existing engine serial number and equipment vehicle identification number,
- The date the existing engine and equipment were compromised and ,
- Provide a description on how the existing engine and equipment were destroyed.
- Provide date-stamped photographs that include visible images of the engine serial number and vehicle identification numbers.

The certification must also specify that no parts or components were or will be parted-out, used or sold as parts, or used to rebuild an engine or equipment that was intended for destruction.

(F) NRCS staff may follow-up with a site visit to verify engine and equipment destruction. Additional destruction procedures may also be directed to assure destruction.

Section 5: Forms & Instructions

Several forms have been developed for this program for the participant or NRCS staff to complete.

(A) **Supplemental Applications:**

The participant must complete the two supplemental forms along with the application. The information provided will be used for determining priority and ranking for funding and payment eligibility purposes. In addition, it may be necessary for the participant to attach records, receipts, ARB Executive Orders, estimates, or any additional information requested by NRCS staff.

The following supplemental forms include:

1. Existing Engine Information
2. New Engine Information

(B) Destruction Certification Form:

The participant must provide a written certification that the existing engine and (if applicable) existing equipment equipped with the existing engine have been destroyed. The certification must specify that no parts or components were or will be parted-out, used or sold as parts, or used to rebuild an engine or equipment that was intended for destruction.

(C) Emissions Reduction Calculations:

The attached form is used for calculating the emission benefits associated with the proposed projects. A ranking calculator developed by Jon Chilcote of the NRCS Fresno Field office will generate a completed form. The emission factors provided through the State of California Carl Moyer Memorial Air Quality Standards Attainment Program guidelines (2008) are used for calculating emissions and ranking projects.

NRCS

Environmental Quality Incentives Program (EQIP)
CALIFORNIA SUPPLEMENTAL APPLICATION FORM

2011

Air Quality - Combustion System Improvement

Agricultural Producer Name:

Existing Engine Information

Complete a separate form for each existing engine or equipment

Describe the type of equipment the existing engine powers:

Site Specific Location Description:

Years operated at this location:

Primary Fuel Type (check one):

- ☐ Diesel
- ☐ Biodiesel
- ☐ Natural Gas
- ☐ LPG
- ☐ Biogas
- ☐ Other:

Engine Type (check one):

- ☐ Non-Tier Diesel
- ☐ Tier 1
- ☐ Tier 2
- ☐ Tier 3
- ☐ Tier 4 Interim
- ☐ Tier 4 Final
- ☐ Spark Ignited
- ☐ Other:

Verified Retrofit Technology:

- ☐ No retrofits have been installed on the existing engine
- ☐ The existing engine is equipped with the following equipment:

Manufacturer: _____

Model: _____

Verification Level: ☐ Level 1 ☐ Level 2 ☐ Level 3

Verified Emission Reductions:

ROG: % NOx: % PM: %

Engine Manufacturer and Model No:

EPA Engine Family:
(If applicable)

Max Rated Brake HP:

Engine Year:

Annual fuel usage:

Engine Serial No:

Annual hours of operation:

Equipment Manufacturer & Model:

Equipment VIN No:

Equipment Model Year:

Year Purchased:

Name of Equipment Owner:

Months in Operation:

☐ Operates throughout the year

- ☐ January
- ☐ February
- ☐ March
- ☐ April
- ☐ May
- ☐ June
- ☐ July
- ☐ August
- ☐ September
- ☐ October
- ☐ November
- ☐ December

Planned location on where engine/equipment will be scrapped and destroyed:
(not applicable if retrofitting an existing engine)

Additional Information:

Instructions
Existing Engine Information

1. **Complete a separate form for each existing engine or equipment**.
2. **Describe the type of equipment the existing engine powers:** This may include an irrigation pump, loader, tractor, combine, harvester, forklift, etc.
3. **Site Specific Location Description:** Best describe the operation location of the existing engine or equipment.
4. **Years Operated at this location:** Approximate length of time the existing engine or equipment has been operating at this location.
5. **Primary Fuel Type:** Only select the primary fuel the engine consumes.
6. **Engine Type:** Select the type of existing engine (i.e. Non-Tier Diesel). Please consult your engine vendor.
7. **Verified Retrofit Technology:** If applicable, describe the manufacturer, model, ARB-Verification Level, and the emission reductions associated with the installed technology. Attach documentation, including the applicable ARB Executive Order. This information should be available through your engine vendor or on-line at: www.arb.ca.gov/diesel/verdev/vdb/vdb.php.
8. **Engine Manufacturer and Model No:** Make and model number of the existing engine. For example, Cummins (make) 6BTA5.9C (model). Please *do not* report the Equipment Model Number here.
9. **EPA Engine Family (if available):** Include the certified engine family name assigned by the US-EPA. Attach the applicable ARB Executive Order for this engine. This information should be available through your engine vendor or on-line at: www.arb.ca.gov/msprog/offroad/cert/cert.php. Any ARB Executive Order reporting a Family Emission Level (FEL) value exceeding an applicable NOx, NMHC+NOx, CO, or PM emission standard may not be eligible for NRCS payments.
10. **Engine Year:** The year the engine model was manufactured.
11. **Engine Serial No.:** The serial number listed on the engine block or ID label.
12. **Max Rated Brake HP**: Identify the engine break horsepower rating.
13. **Annual Fuel Usage:** Amount of annual fuel usage in gallons.
14. **Annual Hours of Operation:** Engine's annual operation in hours.
15. **Equipment Manufacturer and Model:** The make and model number of the equipment. For example, a Case (make) 721 (model). This number is not the engine model number.
16. **Equipment VIN:** The equipment Vehicle Identification Number.
17. **Equipment Model Year:** The model year in which the equipment was manufactured.
18. **Year Purchased:** The year the equipment was purchased.
19. **Name of Equipment Owner:** Identify equipment ownership.
20. **Months in Operation:** Select whether the engine operates throughout the year or by month.
21. **Planned location where engine/equipment will be scrapped and destroyed:** Identify where the engine/equipment is planned to be taken for final disposal and destruction. No engine, drive-train or equipment components shall be recycled as used parts that might prolong the life of other engines and equipment.
22. **Additional Information**: Include any additional information pertinent to this engine/equipment, including applicable permits or documentation issued by a local air district.

NRCS

Environmental Quality Incentives Program (EQIP)
CALIFORNIA SUPPLEMENTAL APPLICATION FORM

2011

Air Quality – Combustion System Improvement

Agricultural Producer:

New Engine Information
Verified Technology Retrofit Installation

Complete a separate form for each engine or equipment

Describe the type of equipment the engine powers:

Site Specific Location Description:

Primary Fuel Type (check one):	Engine Type (check one):	Verified Retrofit Technology:
☐ Diesel ☐ Biodiesel ☐ Natural Gas ☐ LPG ☐ Biogas ☐ Electric ☐ Other:	☐ Tier 3 ☐ Tier 4 Interim ☐ Tier 4 Final ☐ Spark Ignited ☐ Electric ☐ Other:	☐ No retrofits are proposed for the new engine ☐ Propose to install the following retrofit on the existing engine: ☐ Propose to install the following retrofit on the new engine: Manufacturer: _____ Model: _____ Verification Level: ☐ Level 1 ☐ Level 2 ☐ Level 3 Verified Emission Reductions: NOx: % PM: % ROG: %

Engine Manufacturer and Model:

EPA Engine Family: (attach ARB Executive Order)	Max Rated Brake HP:
Engine Year	Annual Fuel Usage: (Estimate)
Engine Serial Number (if available)	Annual Hours of Operation: (Estimate)

Equipment Manufacturer and Model:

Equipment VIN No: (if available)	Equipment Model Year:

Months in Operation:

☐ Operates throughout the year

☐ January	☐ February	☐ March
☐ April	☐ May	☐ June
☐ July	☐ August	☐ September
☐ October	☐ November	☐ December

Cost of New Engine and/or Equipment : (Attach an estimate)	Cost to Retrofit: (Attach an estimate)

Describe the fuel source (i.e. location of fuel storage and dispensing system, battery recharging station, etc.):

Additional Information (May include documentation from the vendor regarding repower solutions or equipment limitations):

Instructions

New Engine Information
Verified Technology Retrofit Installation

1. **Complete a separate form for each new engine or equipment.**
2. **Describe the type of equipment the new engine will power:** This may include a tractor, irrigation pump, forklift, loader, etc.
3. **Site Specific Location Description:** Best describe the operation location for this new engine or equipment.
4. **Primary Fuel Type:** Only select the primary fuel the engine consumes.
5. **Engine Type:** Select the type of engine (i.e. Tier 3). Please consult your engine vendor.
6. **Verified Retrofit Technology:** Will retrofit technology be installed on the new or existing engine? If yes, include the manufacturer, model, ARB-Verification Level, and the associated emission reductions with the installed technology. Attach documentation, including the applicable ARB Executive Order. This information should be available through your engine vendor or on-line at: www.arb.ca.gov/diesel/verdev/vdb/vdb.php.
7. **Engine Manufacturer and Model No:** Make and model number of the new engine. For example, IVECO (make) F4GE9484D*J (model). Please *do not* report the Equipment Model Number here.
8. **EPA Engine Family (if available):** Include the certified engine family name assigned by the US-EPA. Attach the applicable ARB Executive Order for this engine. This information should be available through your engine vendor or on-line at: www.arb.ca.gov/msprog/offroad/cert/cert.php. Any ARB Executive Order reporting a Family Emission Level (FEL) value exceeding an applicable NOx, NMHC+NOx, CO, or PM emission standard may not be eligible for NRCS payments.
9. **Engine Year:** The year the engine model was manufactured.
10. **Engine Serial No.:** If available, include the serial number listed on the engine block or ID label.
11. **Max Rated Brake HP**: Identify the new engine break horsepower rating.
12. **Annual Fuel Usage:** Estimate the annual fuel usage in gallons.
13. **Annual Hours of Operation:** Estimate the engine's annual operations in hours.
14. **Equipment Manufacturer and Model:** The make and model number of the equipment. For example, a Case (make) 721 (model).
15. **Equipment VIN:** The equipment Vehicle Identification Number, if available.
16. **Equipment Model Year:** The model year in which the equipment was manufactured, if available.
17. **Months in Operation:** Select whether the engine will operate throughout the year or by month.
18. **Cost of New Engine and/or Equipment:** Attach an estimate that clearly itemizes the costs.
19. **Cost to Retrofit:** Attach an estimate from the vendor and/or mechanic that clearly itemizes the costs to retrofit the engine.
20. **Describe the fuel source:** How will fuel be supplied to the new equipment.
21. **Additional Information**: Include any information pertinent to this engine or equipment, including: engine-repower solutions or equipment limitations to repower from the vendor or manufacturer, and applicable permits or documentation issued by a local air district

Environmental Quality Incentives Program (EQIP)

CALIFORNIA ENGINE/EQUIPMENT DESTRUCTION CERTIFICATION

Air Quality – Combustion System Improvement

This certification serves to document that the engine/equipment identified below has been disabled and permanently destroyed by shearing, crushing, or shredding into scrap metal. No engine or drive-train components were or will be parted-out, used or sold as parts, or used to rebuild equipment intended for destruction. The completed certification shall be signed and submitted to the NRCS Field Office after destruction.

Agricultural Producer:	
Contract Number:	
Engine Manufacturer and Model:	Equipment Manufacturer and Model:
☐ Diesel Engine ☐ Spark-Ignition Engine	Equipment Type:
Engine Serial No:	Equipment VIN:
Engine Model Year:	Equipment Model Year:
Date engine/equipment was disabled (a 6" minimum hole punched in the block, etc.):	
Engine/Equipment Owner's Name (Print):	
Owner's Signature:	Date:

The engine/equipment identified above were delivered for disposal and destruction at:

Dismantler Company Name:		
Address:		
City:	State:	Zip Code:
Date engine/equipment was scrapped:		

The engine/equipment has been destroyed and scrapped.

Dismantler Contact Name (Print):	Phone No:
Contact Signature:	Date:

Please attach date stamped photographs of the disabled engine/equipment that the identify engine serial number and/or vehicle identification number, the hole punched in the engine block, and locations where the drive train and structural components were compromised.

NRCS

CALIFORNIA EMISSIONS CALCULATION WORKSHEET **2011**

Air Quality - Combustion System Air Emissions Management
Off-Road Mobile/Stationary Engine Emissions Determination

Producer Name: Date:

Existing Engine Emissions Calculations

Existing Engine: Manufacturer: _____

Model Year Engine: _____ Fuel Type: _____

Equipment Type: _____

Serial Number: _____

Baseline Emissions		**NOx**	**ROG**	**PM10**	
Maximum Rated Brake Horsepower:					$bhp_{maximum}$
Annual Hours of Operation:	**x**				Hours/Year
Emission Factors:	**x**				g/bhp-hr
Load Factor:	**x**				
Conversion to Tons:	**÷**	**907,200**	**907,200**	**907,200**	Grams/Ton
Annual Emissions (EE)	**=**				Tons/Year

New Engine Emissions Calculations (Report as zero emissions if electric)

New Engine: Manufacturer: _____

Model Year Engine: _____ Fuel Type: _____

Equipment Type: _____

Serial Number (if available): _____

New Engine Emissions		**NOx**	**ROG**	**PM10**	
Maximum Rated Brake Horsepower:					$bhp_{maximum}$
Annual Hours of Operation:	**x**				Hours/Year
Emission Factors:	**x**				g/bhp-hr
Load Factor:	**x**				
Conversion to Tons:	**÷**	**907,200**	**907,200**	**907,200**	Grams/Ton
Annual Emissions (NE)	**=**				Tons/Year

Calculation Results

	NOx	**ROG**	**PM10**	
Annual Emission Reductions: (EE) – (NE) =				Tons/Year
Percent Emission Reductions: [(EE – NE) / (EE)] x 100 =				%

Section 6: Emission Factors and Standards for Agricultural Engines

The emission estimation methods summarize the data needed to calculate the emission reductions and cost effectiveness of potential projects. Included data are engine emission factors, load factors, and other conversion factors used for calculating emissions.

At a minimum, emission calculations require the following data:

- Engine Model Year
- Engine Rated Brake Horsepower
- Type of equipment the engine powers (to determine the load factor)
- Annual hours the engine operations
- Applicable emission factors

Emissions calculations will examine the emissions from the existing equipment to establish a baseline and the emissions from the new equipment. An emissions inventory will be developed based on this data to estimate the annual emissions or NOx, ROG (NMHC or VOC), and PM10 and to calculate the emission reductions that results from implementing this conservation practice.

Cost effectiveness calculations will generally not be used for ranking potential projects. Instead, the ranking criteria will consider cost effectiveness along with its criteria. However, any cost effective analysis used to determine program effectiveness will utilize a maximum cost-effective threshold determined by the State Conservationist or will a maximum value established by the most current State of California Carl Moyer Memorial Air Quality Standards Attainment Program guidelines.

Emissions Calculations

Pounds/hour = (EF g/bhp-hr) x (engine max rated bhp) x (load factor) x (1 lb/456 grams)

$$\text{Tons/year} = \frac{[(\text{EF g/bhp-hr}) \times (\text{engine max rated bhp}) \times (\text{annual hours}) \times (\text{load factor})]}{(907{,}200 \text{ g/ton})}$$

Table 1
Uncontrolled Off-Road Compression-Ignition (Diesel) Engines
Emission Factors (g/bhp-hr)

Horsepower	Model Year	NOx	ROG	PM10
50 – 119	Pre 1988	12.09	1.73	0.547
	1988 – 1995	8.14	1.19	0.497
120 +	Pre 1970	13.02	1.59	0.554
	1970 – 1979	11.19	1.20	0.396
	1980 – 1987	10.23	1.06	0.396
	1988 – 1995	7.60	0.82	0.274

Source: 2008 Carl Moyer Program Guidelines, Table B-12

Table 2
Controlled Off-Road Compression-Ignition (Diesel) Engines
Emission Factors (g/bhp-hr)

Tier	Horsepower	NOx	ROG	PM10
1	50 - 119	6.54	1.19	0.552
	120 - 174	6.54	0.82	0.274
	175 +	5.93	0.38	0.108
2	50 - 119	4.75	0.23	0.192
	120 - 174	4.17	0.19	0.128
	175 - 250	4.15	0.12	0.088
	251 +	3.79	0.12	0.088
3	50 - 119	2.74	0.12	0.160
	120 - 174	2.32	0.12	0.112
	175 - 750	2.32	0.12	0.088
4 Interim	50 - 119	2.40	0.11	0.056
	120 - 174	2.15	0.11	0.008
	175 - 750	1.29	0.08	0.008
	>750	2.24	0.12	0.048
4 Final	50 - 119	1.33	0.08	0.008
	120 – 750	0.26	0.06	0.008
	>750	2.24	0.06	0.016

Source: 2008 Carl Moyer Program Guidelines, Table B-13
Updated by using the ultra low-sulfur diesel fuel correction factors (Air Resources Board, October 18, 2010)

Table 3
Diesel Agricultural Equipment Default Load Factors

Tillers	0.78	Balers	0.53
Combines	0.70	Sprayers	0.50
Tractors	0.70	Hydro Power Units	0.48
Irrigation Pumps	0.65	Mowers	0.43
Loaders/Backhoes	0.55	Forklifts	0.30
Swathers	0.55	Other Agricultural	0.51

Source: 2008 Carl Moyer Program Guidelines, Table B-11

Table 4
Off-Road Large Spark-Ignited Engines
Emission Factors (g/bhp-hr)

Horsepower	Fuel	Model Year	NOx	ROG	PM10
50-120	Gasoline	Uncontrolled – Pre 2004	11.84	2.66	0.060
		Controlled 2001-2006	1.78	0.26	0.060
		Controlled 2007-2009	1.19	0.18	0.060
		Controlled 2010+	0.36	0.05	0.060
	Alt Fuel	Uncontrolled – Pre 2004	10.51	1.02	0.060
		Controlled 2001-2006	1.58	0.11	0.060
		Controlled 2007-2009	1.05	0.07	0.060
		Controlled 2010+	0.32	0.02	0.060
>120	Gasoline	Uncontrolled – Pre 2004	12.94	1.63	0.060
		Controlled 2001-2006	1.94	0.16	0.060
		Controlled 2007-2009	1.29	0.11	0.060
		Controlled 2010+	0.39	0.03	0.060
	Alt Fuel	Uncontrolled – Pre 2004	10.51	0.90	0.060
		Controlled 2001-2006	1.58	0.09	0.060
		Controlled 2007-2009	1.05	0.06	0.060
		Controlled 2010+	0.32	0.02	0.060

Source: 2008 Carl Moyer Program Guidelines, Table B-15

Table 5
Off-Road Large Spark-Ignited Equipment Default Load Factors

Combines	0.74	Sprayers	0.50
Tractors	0.62	Loaders/Backhoes	0.48
Balers	0.55	Forklifts	0.30
Swathers	0.52	Other Agricultural	0.55

Source: 2008 Carl Moyer Program Guidelines, Table B-14

Table 1. ARB and USEPA Off-Road Compression-Ignition (Diesel) Engine Standards (NMHC+NOx/CO/PM in g/bhp-hr). When ARB and USEPA standards differ, the standards shown here represent the more stringent of the two.

Maximum horsepower	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015+
<11	See Table 2 footnote (a)					7.8 / 6.0 / 0.75					5.6 / 6.0 / 0.6			5.6 / 6.0 / 0.30[a]							
11≤hp<25						7.1 / 4.9 / 0.60					5.6 / 4.9 / 0.60			5.6 / 4.9 / 0.30							
25≤hp<50	-					7.1 /4.1 / 0.60				5.6 / 4.1 / 0.45				5.6 / 4.1 / 0.22					3.5 / 4.1 / 0.02		
50≤hp< 75						- / 6.9 / - / -[b]				5.6 / 3.7 / 0.30				3.5 / 3.7 / 0.22[e]					3.5 / 3.7 / 0.02[e]		
75≤hp<100														3.5 / 3.7 / 0.30			0.14 / 2.5 / 3.7 / 0.015[b,c]				0.14 / 0.30 / 3.7 / 0.015[b]
100≤hp<175									4.9 / 3.7 / 0.22				3.0 / 3.7 / 0.22								
175≤hp<300									4.9 / 2.6 / 0.15												
300≤hp<600	-		1.0 / 6.9 / 8.5 / 0.40[b]					4.8 / 2.6 / 0.15				3.0 / 2.6 / 0.15[e]					0.14 / 1.5 / 2.6 / 0.015[b,c]				0.14 / 0.30 / 2.2 / 0.015[b]
600≤hp≤750																					
Mobile Machines > 750hp			-			1.0 / 6.9 / 8.5 / 0.40[b]						4.8 / 2.6 / 0.15						0.30 / 2.6 / 2.6 / 0.07[b]			0.14 / 2.6 / 2.6 / 0.03[b]
750hp<GEN ≤1200hp																					0.14 / 0.50 / 2.6 / 0.02[b]
GEN>1200 hp																		0.30 / 0.50 / 2.6 / 0.07[b]			

a) The PM standard for hand-start, air cooled, direct injection engines below 11 hp may be delayed until 2010 and be set at 0.45 g/bhp-hr.
b) Standards given are NMHC/NOx/CO/PM in g/bhp-hr.
c) Engine families in this power category may alternately meet Tier 3 PM standards (0.30 g/bhp-hr) from 2008-2011 in exchange for introducing final PM standards in 2012.
d) The implementation schedule shown is the three-year alternate NOx approach. Other schedules are available.
e) Certain manufacturers have agreed to comply with these standards by 2005.

: Tier 1 : Tier 2 : Tier 3 : Tier 4 Interim / Final

Section 5: FY 2011 Screening and Ranking

The screening and ranking criteria are specified in the FY 2011 Air Quality Initiative Program documents.

2011 CIG (b) Air Quality Screening Criteria

Screening Criteria: Select One of the following and transfer priority results to CIG (b) Air Quality Ranking Worksheet - FY 2011		
A	**Combustion System Improvement** [NOx/VOC (Ozone), PM10/PM2.5]: Proposal to repower, replace, or retrofit a high polluting, fully functional engine with a newer engine meeting the most current model year California emission standards where: • The existing diesel engine is a pre-1980 uncontrolled (Tier 0) engine; or • The existing diesel engine is an uncontrolled (Tier 0) or Tier 1 engine emitting at least one ton of NOx annually; or • The proposed project will result in replacing two or more existing mobile off-road engines for one new mobile off-road engine, provided that at least one of the existing engines is an uncontrolled (Tier 0) diesel engine; or • The existing engine utilizing any fuel type is replaced with electric technology; or • Any new installation that will utilize electric technology exclusively in lieu of installing a new internal combustion engine.	**High Priority** (60 points)
B	**Combustion System Improvement** [NOx/VOC (Ozone), PM10/PM2.5]: Proposal to repower, replace, or retrofit a high polluting, fully functional engine with a newer engine meeting the most current model year California emission standards where the existing engine is: • The existing diesel engine is a 1980 model year or newer uncontrolled (Tier 0) or a Tier 1 diesel engine that emits less than one ton of NOx annually; **or,** **Compliance with Permit or Regulatory Actions:** Proposed EQIP plan or contract will assist with compliance of a rule requirement, permit condition or regulatory action.	**Medium Priority** (40 Points)
C	**Combustion System Improvement** [NOx/VOC (ozone), PM10/PM2.5]: Proposal to repower, replace, or retrofit a high polluting, fully functional engine with a newer engine meeting the most current model year California emission standards where: • The existing diesel engine is a Tier 2 engine; or • The existing engine operates on fuels other than diesel, such as gasoline, propane, butane, CNG, etc.	**Low Priority** (20 points)

2011 Air Quality Enhancement Screening Criteria

Screening Criteria: Select One of the following and transfer priority results to Air Quality Enhancement Ranking Worksheet - FY 2011		
A	**NOx/VOC (Ozone), PM10/PM2.5 [Combustion System Improvement]:** Proposal to repower a fully functional diesel irrigation pump engine with a newer engine meeting the most current model year California emission standards or with a new electric motor; **or,** **NOx/VOC (Ozone); PM10/PM2.5 Initiatives:** All proposed EQIP plan or contract on this treatment unit will address three or more Air Quality related objectives; **or,** **NOx/VOC (Ozone); PM10/PM2.5 Initiatives:** Proposed EQIP plan or contract on this treatment unit will assist applicant avoid pending regulatory or enforcement action.	**High Priority** (60 points)
B	**NOx/VOC (Ozone); PM10/PM2.5:** Proposed EQIP plan or contract on this treatment unit will address two or more Air Quality related objectives; **or,** **PM10/PM2.5 Initiative:** Proposed EQIP plan or contract on this treatment unit will address reduction of Particulate Matter within a critical time period or will assist applicant in compliance with permit or regulatory actions.	**Medium Priority** (40 Points)
C	**NOx/VOC (Ozone); PM10/PM2.5:** All other situations which address air quality objectives.	**Low Priority** (20 points)

One Ton of NOx

For screening purposes, post-1980 manufactured diesel engines emitting at least one ton of NOx emissions will be screened as “High Priority”. This table may be used to quickly estimate the one ton minimum of emissions for screening purposes only.

Rated bhp	Diesel Engine Model Year Annual Hours			Rated bhp	Diesel Engine Model Year Annual Hours		
	1980-1987	1988-1995	Tier 1		1980-1987	1988-1995	Tier 1
50	2,100	3,200	4,000	350	360	490	620
60	1,800	2,700	3,300	360	350	470	610
70	1,500	2,300	2,800	370	340	460	590
80	1,300	2,000	2,500	380	330	450	580
90	1,200	1,800	2,200	390	320	440	560
100	1,100	1,600	2,000	400	320	430	550
110	1,100	1,400	1,800	410	310	420	530
120	1,100	1,400	1,700	420	300	410	520
130	970	1,300	1,500	430	290	400	510
140	900	1,200	1,400	440	290	390	500
150	840	1,100	1,300	450	280	380	490
160	790	1,100	1,200	460	280	370	480
170	750	1,000	1,200	470	270	360	460
180	700	950	1,200	480	260	360	460
190	670	900	1,200	490	260	350	450
200	630	850	1,100	500	250	340	440
210	600	810	1,000	510	250	330	430
220	580	780	990	520	240	330	420
230	550	740	950	530	240	320	410
240	530	710	910	540	230	320	400
250	510	680	870	550	230	310	400
260	490	660	840	560	230	300	390
270	470	630	810	570	220	300	380
280	450	610	780	580	220	290	380
290	440	590	750	590	210	290	370
300	420	570	730	600	210	280	360
310	410	550	700	610	210	280	360
320	400	530	680	620	200	280	350
330	380	520	660	630	200	270	350
340	370	500	640	640+	200	270	340

Rounded values based on the 0.70 Load Factor for Tractors

Environmental Quality Incentives Program (EQIP)
CALIFORNIA STATE RANKING CRITERIA WORKSHEET

2011

Air Quality – Combustion System Improvement

Producer Name:	Application No:	Date:
CTU:	Existing Engine Serial No(s):	
Technician:		

	Air Quality Resource						Environmental Points		
							Planned	**Benchmark**	**Difference**
		20 Points	**16 Points**	**10 Points**	**4 Points**	**1 Point**			
1	*NOx Emission Reductions* *(from worksheet)*	*Greater than 3 tons/year or is installing an electric project*	*3 tons/year or less, but greater than 2 tons/year*	*2 tons/year or less, but greater than 1 ton/year*	*1 ton/year or less, but greater than 0.1 tons/year*	*0.1 tons/year or less*		0	
		20 Points	**16 Points**	**10 Points**	**4 Points**	**1 Point**			
2	*Percent NOx Reductions* *(from worksheet)*	*100%*	*Between 100% and 80%*	*80% or less, but greater than 70%*	*70% or less, but greater than 50%*	*50% or less*		0	
		20 Points	**16 Points**	**10 Points**	**4 Points**	**1 Point**			
3	*VOC (ROG) Emission Reductions* *(from worksheet)*	*Greater than 0.4 tons/year or is installing an electric project*	*0.4 tons/year or less, but greater than 0.3 tons/year*	*0.3 tons/year or less, but greater than 0.2 tons/year*	*0.2 tons/year or less, but greater than 0.1 tons/year*	*0.1 tons/year or less*		0	
		20 Points	**16 Points**	**10 Points**	**4 Points**	**1 Point**			
4	*PM10 Emission Reductions* *(from worksheet)*	*Greater than 0.1 tons/year or is installing an electric project*	*0.1 tons/year or less, but greater than 0.08 tons/year*	*0.08 tons/year or less, but greater than 0.05 tons/year*	*0.05 tons/year or less, but greater than 0.02 tons/year*	*0.02 tons/year or less*		0	
		20 Points	**15 Points**	**10 Points**	**5 Points**	**1 Point**			
5	*NAAQS Nonattainment Designation* *(Select One)*	*Extreme or Severe, Designation*	*Serious Designation*	*Marginal or Moderate Designation*	*Subpart 1 or Nonattainment Designation*	*In Attainment*		0	
						Total Points:		0	
						Total Environmental Score (Planned – Benchmark):			

*NAAQS Nonattainment Designation**

Extreme:	*Fresno, Kern, Kings, Los Angeles, Madera, Merced, Orange, Riverside, San Bernardino, San Joaquin, Stanislaus, Tulare*
Severe:	*Placer, Sacramento, Solano, Yolo*
Serious:	*El Dorado, Inyo, Ventura*
Marginal:	*Alameda, Contra Costa, Marin, Napa, San Mateo, Santa Clara, Sonoma*
Moderate:	*Imperial, Mono*
Subpart 1:	*Amador, Butte, Calaveras, Mariposa, Nevada, San Diego, Sutter, Tuolumne*
Nonattainment:	*Yuba*

** Some areas reflect ARB's reclassification requests to EPA.*

EPA Designated Nonattainment Areas in California For All Criteria Pollutants (NAAQS)

Alameda Co
- *8-Hr Ozone* San Francisco Bay Area, CA - Marginal
- *PM-2.5 2006* San Francisco Bay Area, CA - Nonattainment

Amador Co
- *8-Hr Ozone* Amador and Calaveras Cos (Central Mtn), CA - Former Subpart 1

Butte Co
- *8-Hr Ozone* Chico, CA - Former Subpart 1
- *PM-2.5 2006* * Chico, CA - Nonattainment

Calaveras Co
- *8-Hr Ozone* Amador and Calaveras Cos (Central Mtn), CA - Former Subpart 1

Contra Costa Co
- *8-Hr Ozone* San Francisco Bay Area, CA - Marginal
- *PM-2.5 2006* San Francisco Bay Area, CA - Nonattainment

El Dorado Co
- *8-Hr Ozone* * Sacramento Metro, CA - Severe 15
- *PM-2.5 2006* * Sacramento, CA - Nonattainment

Fresno Co
- *8-Hr Ozone* San Joaquin Valley, CA - Extreme
- *PM-2.5 1997* San Joaquin Valley, CA - Nonattainment
- *PM-2.5 2006* San Joaquin Valley, CA - Nonattainment

Imperial Co
- *8-Hr Ozone* Imperial Co, CA - Moderate
- *PM-10* * Imperial Valley, CA - Serious
- *PM-2.5 2006* * Imperial Co, CA - Nonattainment

Inyo Co
- *PM-10* * Coso Junction, CA - Moderate
- *PM-10* * Owens Valley, CA - Serious

Kern Co
- *8-Hr Ozone* * Kern Co (Eastern Kern), CA - Former Subpart 1
- *8-Hr Ozone* * San Joaquin Valley, CA - Extreme
- *PM-10* * East Kern Co, CA - Serious
- *PM-2.5 1997* * San Joaquin Valley, CA - Nonattainment
- *PM-2.5 2006* * San Joaquin Valley, CA - Nonattainment

Kings Co
- *8-Hr Ozone* San Joaquin Valley, CA - Extreme
- *PM-2.5 1997* San Joaquin Valley, CA - Nonattainment
- *PM-2.5 2006* San Joaquin Valley, CA - Nonattainment

Los Angeles Co
- *8-Hr Ozone* * Los Angeles South Coast Air Basin, CA - Extreme
- *8-Hr Ozone* * Los Angeles-San Bernardino Cos(W Mojave),CA - Moderate
- *PM-10* * Los Angeles South Coast Air Basin, CA - Serious
- *PM-2.5 1997* * Los Angeles-South Coast Air Basin, CA - Nonattainment
- *PM-2.5 2006* * Los Angeles-South Coast Air Basin, CA - Nonattainment

Madera Co
- *8-Hr Ozone* San Joaquin Valley, CA - Extreme
- *PM-2.5 1997* San Joaquin Valley, CA - Nonattainment
- *PM-2.5 2006* San Joaquin Valley, CA - Nonattainment

Marin Co
- *8-Hr Ozone* San Francisco Bay Area, CA - Marginal
- *PM-2.5 2006* San Francisco Bay Area, CA - Nonattainment

Mariposa Co
- *8-Hr Ozone* Mariposa and Tuolumne Cos (Southern Mtn),CA - Former Subpart 1

Merced Co
- *8-Hr Ozone* San Joaquin Valley, CA - Extreme
- *PM-2.5 1997* San Joaquin Valley, CA - Nonattainment
- *PM-2.5 2006* San Joaquin Valley, CA - Nonattainment

Mono Co
- *PM-10* * Mammoth Lake, CA - Moderate
- *PM-10* * Mono Basin, CA - Moderate

Napa Co
- *8-Hr Ozone* San Francisco Bay Area, CA - Marginal
- *PM-2.5 2006* San Francisco Bay Area, CA - Nonattainment

Nevada Co
- *8-Hr Ozone* * Nevada Co. (Western Part), CA - Former Subpart 1

Orange Co
- *8-Hr Ozone* Los Angeles South Coast Air Basin, CA - Extreme
- *PM-10* Los Angeles South Coast Air Basin, CA - Serious
- *PM-2.5 1997* Los Angeles-South Coast Air Basin, CA - Nonattainment
- *PM-2.5 2006* Los Angeles-South Coast Air Basin, CA - Nonattainment

Placer Co
- *8-Hr Ozone* * Sacramento Metro, CA - Severe 15
- *PM-2.5 2006* * Sacramento, CA - Nonattainment

Riverside Co
- *8-Hr Ozone* * Los Angeles South Coast Air Basin, CA - Extreme
- *8-Hr Ozone* * Riverside Co, (Coachella Valley), CA - Severe 15
- *PM-10* * Coachella Valley, CA - Serious
- *PM-10* * Los Angeles South Coast Air Basin, CA - Serious
- *PM-2.5 1997* * Los Angeles-South Coast Air Basin, CA - Nonattainment
- *PM-2.5 2006* * Los Angeles-South Coast Air Basin, CA - Nonattainment

Sacramento Co
- *8-Hr Ozone* Sacramento Metro, CA - Severe 15
- *PM-10* Sacramento Co, CA - Moderate
- *PM-2.5 2006* Sacramento, CA - Nonattainment

San Bernardino Co
- *8-Hr Ozone* * Los Angeles South Coast Air Basin, CA - Extreme
- *8-Hr Ozone* * Los Angeles-San Bernardino Cos(W Mojave),CA - Moderate
- *PM-10* * Los Angeles South Coast Air Basin, CA - Serious
- *PM-10* * San Bernardino Co, CA - Moderate
- *PM-10* * Trona, CA - Moderate
- *PM-2.5 1997* * Los Angeles-South Coast Air Basin, CA - Nonattainment
- *PM-2.5 2006* * Los Angeles-South Coast Air Basin, CA - Nonattainment

San Diego Co
- *8-Hr Ozone* * San Diego, CA - Former Subpart 1

San Francisco Co
- *8-Hr Ozone* San Francisco Bay Area, CA - Marginal
- *PM-2.5 2006* San Francisco Bay Area, CA - Nonattainment

San Joaquin Co
- *8-Hr Ozone* San Joaquin Valley, CA - Extreme
- *PM-2.5 1997* San Joaquin Valley, CA - Nonattainment
- *PM-2.5 2006* San Joaquin Valley, CA - Nonattainment

San Mateo Co
- *8-Hr Ozone* San Francisco Bay Area, CA - Marginal
- *PM-2.5 2006* San Francisco Bay Area, CA - Nonattainment

Santa Clara Co
8-Hr Ozone San Francisco Bay Area, CA - Marginal
PM-2.5 2006 San Francisco Bay Area, CA - Nonattainment

Solano Co
8-Hr Ozone * Sacramento Metro, CA - Severe 15
8-Hr Ozone * San Francisco Bay Area, CA - Marginal
PM-2.5 2006 * Sacramento, CA - Nonattainment
PM-2.5 2006 * San Francisco Bay Area, CA - Nonattainment

Sonoma Co
8-Hr Ozone * San Francisco Bay Area, CA - Marginal
PM-2.5 2006 * San Francisco Bay Area, CA - Nonattainment

Stanislaus Co
8-Hr Ozone San Joaquin Valley, CA - Extreme
PM-2.5 1997 San Joaquin Valley, CA - Nonattainment
PM-2.5 2006 San Joaquin Valley, CA - Nonattainment

Sutter Co
8-Hr Ozone * Sacramento Metro, CA - Severe 15
8-Hr Ozone * Sutter Co (Sutter Buttes), CA - Former Subpart 1
PM-2.5 2006 Yuba City-Marysville, CA - Nonattainment

Tulare Co
8-Hr Ozone San Joaquin Valley, CA - Extreme
PM-2.5 1997 San Joaquin Valley, CA - Nonattainment
PM-2.5 2006 San Joaquin Valley, CA - Nonattainment

Tuolumne Co
8-Hr Ozone Mariposa and Tuolumne Cos (Southern Mtn),CA - Former Subpart 1

Ventura Co
8-Hr Ozone * Ventura Co, CA - Serious

Yolo Co
8-Hr Ozone Sacramento Metro, CA - Severe 15
PM-2.5 2006 * Sacramento, CA - Nonattainment

Yuba Co
PM-2.5 2006 * Yuba City-Marysville, CA - Nonattainment

** Partial Non-Attainment Area*
Source: http://www.epa.gov/oar/oagps/greenbk/ancl.html
EPA- September 16, 2010