



## **Environmental Quality Incentive Program California Air Quality**

### **Emission Reductions from Replacing Engines Fiscal Year 2012 *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 reciprocating engines 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 effects. Diesel emissions also include oxides of Nitrogen (NO<sub>x</sub>), a precursor to ozone in smog formation that has also been shown to cause adverse health effects. Cost-effective measures for reducing the toxic air contaminants and NO<sub>x</sub> emissions can be achieved with early replacement of old diesel engines powering agricultural equipment.

In December 2010, the NRCS-California signed a "Statement of Principles" with the Environmental Protection Agency-Region 9, the California Air Resources Board, and the San Joaquin Valley Air Pollution Control District establishing a general framework for ensuring the emission reductions from voluntary incentives replacing engines from mobile off-road agricultural equipment receive credit in the State Implementation Plan (SIP). As such, the NRCS is working collaboratively with these agencies, the agricultural communities, and participants in an effort to provide SIP-credible emission reductions that are "surplus, quantifiable, enforceable, and permanent".

#### ***Eligible Projects***

The program replaces high-polluting, fully functional reciprocating engines with the latest reduced-emission engines meeting the most current model-year California emissions standards.

Payments are available to replace existing engines (engine repowers) 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 air district, if applicable. Once in operation, the engine and equipment must be used exclusively in California.

Upgrading or installing fueling stations and infrastructure is not eligible, including but not limited to 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, must be rendered inoperable and disposed of at an approved metal-scrap facility in California, where it is 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 or used as parts that might prolong the life of similar engines. The participant must therefore certify that the old engine and equipment has been rendered useless and destroyed.

The emission reductions achieved from contracts or parts of contracts funded under the air quality initiative are not required by any federal, state, or local regulation, settlement agreement, mitigation requirement, or other legal mandate. No emission reductions will be used as marketable emission reduction credits, to offset any emission obligations, or for credit under any federal, state, or local emission averaging banking and trading program.

NRCS payment schedules are available and vary depending on the type and size of the new engine and equipment. A minimum two-year contract period is required. The participant must initiate the project within the first year of the contract and payment is initiated once all contract obligations are met. It is the participant's responsibility to use and maintain the engine and equipment for the life of the practice.

## Section 1: Definitions

**Add-On Control Device:** an air pollution control device, such as a 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.

**ARB:** the State of California Air Resources Board.

### **Airborne Toxic Control Measure (ATCM) for Stationary Compression-Ignition**

**Engines:** under Title 17, Sections 93115.1 through 93115.15 of the California Code of Regulations, the ARB established emission limits that apply to stationary and portable diesel engines rated at greater than 50 break horsepower, including those used in agriculture. The compliance deadline specified in the ATCM and in any applicable air district rule essentially phases-out the continued use of older stationary and portable engines, including uncontrolled (Tier 0) diesel engines. Once deadlines have passed, replacing subject engines will not result in any emission reduction benefits since these engines are no longer allowed to operate.

The ATCM is posted on-line at:

<http://www.arb.ca.gov/diesel/ag/documents/finalreg112807.pdf>.

**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](http://www.arb.ca.gov/research/aaqs/aaqs2.pdf).

**Auxiliary Engine:** does not self-propel a vehicle or equipment, but provides power for other functions. The fuel, cooling, and exhaust systems are an integral part of the vehicle or equipment.

**Brake Horsepower (bhp):** is the rated horsepower capacity of the engine as defined by the engine nameplate under standard conditions. It is 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 and payment determination is based on an engine's brake horsepower rating.

**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. The California Tier schedule is on Table 1.

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

**Compression-Ignition Internal Combustion Engine:** an engine that uses the heat of compression to initiate combustion. The majority of these engines are fueled by diesel fuel, but some may be designed to operate on bio-diesel or natural gas.

**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 two- or four-stroke internal combustion engine in which liquid fuel injected into the combustion chamber ignites when the air charge is compressed to a temperature sufficiency high for auto-ignition.

**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 establishes 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](http://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. Such engines may operate during non-emergency situations for the purpose of testing, repair or routine maintenance to verify its readiness for emergency standby use. Examples include an engine powering an electric generator to provide electric power or powering a water pump for firefighting or flood control.

**Emission Control System:** any device or system employed with engines or piece of equipment 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 NO<sub>x</sub>, NMHC+NO<sub>x</sub>, CO or PM emission standard (STD) is not eligible for NRCS payments, even if the engine certification values (CERT) are below the emission standards (STD). Only FEL values less than or equal to the emission standards are eligible.

**Farm Bill:** refers to the Food, Conservation and Energy Act of 2008.

**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 compression-ignition 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 will be considered to be equivalent to 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.

**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](http://www.arb.ca.gov/ba/icp/current.pdf).

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

**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](http://www.arb.ca.gov/msprog/offroad/cert/cert.php)

**National Air Quality Initiative:** refers to 2008 Farm Bill [16 USC 3839aa-8, Sec 1240H – “Conservation Innovation Grants and Payments”, Part (b) – “Air Quality Concerns from Agricultural Operations”], which provides payments to producers using innovative technologies and cost-effective methods to address air quality concerns.

**National Air Quality Initiative Eligible Counties:** counties or areas within counties designated by the EPA as “nonattainment” of the NAAQS for a given pollutant are eligible for funding under the National Air Quality Initiative. These counties are:

Alameda, Amador, Butte, Calaveras, Contra Costa, El Dorado, Fresno, Imperial, Inyo, Kern, Kings, Los Angeles, Madera, Marin, Mariposa, Merced, Mono, Napa, Nevada, Orange, Placer, Riverside, Sacramento, San Bernardino, San Francisco, San Diego, San Joaquin, San Mateo, Santa Clara, Solano, Sonoma, Stanislaus, Sutter, Tulare, Tuolumne, Ventura, Yolo, and Yuba.

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

EPA maintains a list of federally designated nonattainment areas for criteria air pollutants on-line at: <http://www.epa.gov/oar/oagps/greenbk/ancl.html>.

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

**NO<sub>x</sub>:** a general designation pertaining to compounds of nitric oxide (NO), nitrogen dioxide (NO<sub>2</sub>) and other oxides of nitrogen. NO<sub>x</sub> is typically created during the combustion processes and are major contributors to ozone formation and acid deposition. NO<sub>2</sub> causes adverse health effects, is a criteria air pollutant and a major component in smog formation. This designation does not include nitrous oxide (N<sub>2</sub>O), which is designated as a greenhouse gas.

**Off-Road Compression-Ignition Equipment:** mobile equipment that cannot be registered and driven safely on a road or was not designed to be driven on a road. Newer equipment use engines certified by the ARB to the off-road compression-ignition or diesel engine standards and used to self-propel the vehicle.

**Off-Road Spark-Ignited Equipment:** mobile equipment that cannot be registered and driven safely on-road or was not designed to be driven on-road. Newer equipment

use engines certified by the ARB to the off-road spark ignition engine standards and used to self-propel the vehicle.

**Ozone:** a form of molecular oxygen that consists of three oxygen atoms linked together (O<sub>3</sub>). 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 effects, 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. PM<sub>2.5</sub> has an aerodynamic diameter equal to or less than 2.5 microns and PM<sub>10</sub> 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 effects. PM also causes visibility reduction and contributes to regional haze.

**Portable Agricultural Engine:** an internal combustion engine designed and capable of being carried or moved from one location to another, does not propel a vehicle, and is used in the production of crops or the raising of fowl or animals. Portable engines operate similar to stationary engines by providing power to stationary components, such as irrigation wells or emergency electrical energy. Portable engines are generally not designed to operate while being moved from one location to the other. Indicators of portability include: wheels, skids, carrying handles, dolly, trailer, or platform.

**Power Take-Off Horsepower:** is the “usable” horsepower measurement at the power take-off (PTO) shaft’s output and is the power available for tractor attachments and implements. For purposes of Practice Code 372, situations where the horsepower of an existing engine cannot be determined from an engine label, manual, or engine records, the engine horsepower can be estimated by multiplying the PTO horsepower value by 1.15.

$$\text{Estimated } HP_{\text{Existing Engine}} = \text{PTO } HP_{\text{Existing Engine}} \times 1.15$$

**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 determining engine eligibility and payment rate.

**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](http://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.

**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-Ignition Internal Combustion Engine:** a liquid or gaseous fueled engine designed to ignite its air/fuel mixture by a spark across a spark plug. These engines may operate on gasoline, natural gas, propane, or bio-fuel. Engines that consume dairy digester gas for electric generation are most likely spark-ignition engines.

**State Implementation Plan (SIP):** comprehensive plans describing how an area will attain the NAAQS. The 1990 federal Clean Air Act amendments establish attainment deadlines based on the severity of an area's air pollution problem. In California, SIPs are multiple documents where the ARB is the lead agency for all purposes related to California's SIP. Local air districts, the California Bureau of Automotive Repair, and the California Department of Pesticide Regulation each prepare SIP elements that are submitted to ARB for review and approval. The ARB forwards SIP revisions to the EPA for approval and publication in the Federal Register. All SIP elements are referenced in Code of Federal Regulation Title 40, Chapter 1, Part 52, Subpart F, Section 52.220.

**Stationary Agricultural IC Engine:** an internal combustion engine attached to a foundation, designed to remain and operate at a single location, and used in the production of crops or the raising of fowl or animals. May include engines residing at the same location for specified periods of time (longer than six months or one year) or are used as backup to replace another engine at a location that is intended to perform the same or similar function.

**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 has little to do with 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 (engines bolted to a foundation or concrete slab) or portable (including engines mounted on a trailer or skid, and auxiliary engines on mobile equipment yet not drive a vehicle) engines. This section does not apply to engines that propel mobile vehicles, including vehicles used at a stationary site (such as a tractor powering an irrigation gear-head or pump via a power take-off). The majority of stationary heavy-duty engines used in agriculture are 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 that the participant consult with the local APCD or AQMD to determine permitting and emissions requirements prior to seeking assistance from the NRCS.

The ARB and several California air districts have established compliance deadlines to phase-out the continued use of old compression-ignition stationary engines, primarily Tier 0 diesel engines. Unless exempted, these engines are no longer allowed to operate once a deadline has passed and replacing them will not provide any real emission reductions since continued operation would likely result in excess emissions. Therefore, repowering engines subject to compliance deadlines will not result in any credible emission reductions.

Only engine repowers are eligible for payment under this category. Also eligible are retrofits or add-on control devices. Payments for equipment replacements do not apply to stationary, portable, or auxiliary engines. New electric motor installations are also eligible for payments under this category.

### **Program Requirements**

#### **New electric motor for a new irrigation well site:**

Participants are encouraged to install new electric motors or electric technology in lieu of installing internal combustion engines.

- A) The project must be a new well installation and not a pre-existing well.
- B) The new motor must be rated at least 25 horsepower (19 kilowatts). Electric motors rated at less than 25 hp are not eligible for new installations.
- C) The participant must provide information whether an adequate electric power supply is at the site or provide documentation from the local utility company for

power installation. Infrastructure and installation costs associated with the new electric motor are ineligible for funding.

- D) Electric motors installed at pumping plants must adhere to Practice Code 533, Pumping Plant guidelines, where applicable. An engineering analysis may be required.

### **Existing Engines:**

- A) Existing engines must be situated in its operating location, connected to the equipment it powers (wellhead, booster trailer, or auxiliary engine on harvesting equipment), and in operational condition.
- B) The existing engine must be rated at 50 bhp (37 kilowatts) or more. Engines rated at less than 50 bhp are not eligible.
- C) An operation outfitted with an uncontrolled (Tier 0), Tier 1- or Tier 2-certified diesel engine will be 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).
- D) An operation outfitted with an emissions-controlled spark-ignition engine will be 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).
- E) Existing engines may operate on diesel fuel, gaseous fuels, gasoline, or renewable fuels (such as bio-diesel, bio-fuel, or bio-gas).
- F) Existing spark-ignition engines cannot be replaced with new diesel engines.
- G) Any mobile off-road agricultural, construction, or on-road vehicle powering an irrigation gear-head or pump are not eligible under this section.
- H) The participant must own and operate the existing equipment in California for at least the past 12 months.
- I) The participant must complete the supplemental application form that includes the existing engine manufacturer, fuel-type, model year, serial number.

Complete all required fields in the supplemental application, as leaving fields blank may prolong the application process.

- J) Unless specifically exempted, uncontrolled (Tier 0) diesel stationary engines are no longer permitted by the ARB and/or air district to operate in California. Any proposed project replacing applicable engines will no longer result in emission reductions.

**Replacement with New Engines or Electric Motors:**

- A) The new replacement engine is rated at least 50 bhp (37 kilowatts).
- B) The new replacement electric motor is rated at least 25 horsepower (19 kilowatts), provided that the bhp rating of the existing engine is rated not less than 50 bhp. The applicant shall provide documentation that the lower hp is necessary and conforms to Practice Code 533, Pumping Plant. An engineering analysis or appropriate justification for reducing hp is required. The participant must provide information whether an adequate electric power supply is at the site or provide documentation from the local utility company for power installation.
- 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 Air district, as applicable.
- D) Repowering to a Tier-1 or Tier-2 certified diesel engine is not eligible.
- E) Once in operation, the engine and equipment must be used exclusively in California.
- A) The certification emission standards and Tier designation must be determined from the California Air Resources Board Executive Order or EPA Certificate of Conformity (for federally preempted engines) issued for the specific engine. ARB Executive Orders for certified off-road engines are posted on-line at: <http://www.arb.ca.gov/msprog/offroad/cert/cert/php>.
- F) 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 at or lower than the applicable emission standards are eligible.
- G) Spark-ignited engines must meet or exceed the applicable emission standards established by the ARB or local Air district, whichever is more stringent.

- 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 will be capped at the hp rating of the existing engine and not the hp rating of 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% NO<sub>x</sub> 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) The participant must possess an approved “Registration” or an “Authority to Construct” from the local air district prior to installation, if a registration or permit is required.
- L) The ARB or local air district 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 ARB or local air district before NRCS payments will be provided. The costs associated with source tests or monitoring requirements are not eligible for payments. A list of approved independent contractors is posted on the Internet at: [www.arb.ca.gov/ba/icp/current.pdf](http://www.arb.ca.gov/ba/icp/current.pdf)
- M) The participant must complete the supplemental application form for the new engine. If available, record the new engine manufacturer, fuel-type, model year, serial number. Complete all required fields in the supplemental application, as leaving fields blank may prolong the application process.
- N) Future engine operational hours for determining emission reductions must be based only on readings from an installed and fully operational hour meter. The participant must maintain a record of annual hourly usage for life of the project by recording hours at the beginning and end of each calendar year. If the hourly meter is no longer functioning, it must be repaired or replaced as soon as possible at the participant’s cost. An alternative method for documenting equipment usage and emission reductions may be evaluated on a case-by-case

basis, including fuel usage logs. For electric motors, records from dedicated utility meters may be used.

- O) 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 NO<sub>x</sub> or NO<sub>x</sub>+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 NO<sub>x</sub>+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 NO<sub>x</sub> or NO<sub>x</sub>+NMHC emissions by at least 15% from the applicable NO<sub>x</sub> or NO<sub>x</sub>+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 an off-road agricultural vehicle and do not include portable engines, auxiliary engines mounted on mobile equipment, or on-road mobile equipment.

Replacing engines on mobile off-road agricultural equipment is funded under the National Air Quality Initiative.

#### **Program Requirements**

##### **Existing Equipment:**

- A) The existing engine and equipment shall be fully functional and 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 power a mobile off-road agricultural vehicle, be rated at 50 or more bhp, and used to self-propel the vehicle.
  
- C) **Engine Repowers:** In-use 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 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) A tractor, loader, harvester, bailer, Class 7 rough-terrain forklift, or other self-propelled agricultural equipment outfitted with an uncontrolled (Tier 0), Tier 1-, or Tier 2-certified diesel engine and replaced with equipment outfitted with the latest current model year Tier-certified diesel engine.
- (2) An existing forklift equipped with a compression- or spark-ignition internal combustion engine is replaced with an electric-powered forklift. Eligible are new Class 1 electric forklifts with life codes 4, 5, or 6, rated with at least 3,000 pound lift capacity. Electric hand carts are not eligible, as these are not forklifts.

**Replacement:**

- A) The replaced engine shall be rated at least 50 bhp.
- B) Existing equipment outfitted with spark-ignited engines cannot be replaced with new diesel-powered engines.
- C) 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 Air district, as applicable. Once in operation, the engine and equipment must be used exclusively in agriculture within California.
- D) The certification emission standards and Tier designation must be determined from the California Air Resources Board Executive Order or EPA Certificate of Conformity (for federally preempted engines) issued for the specific engine. ARB Executive Orders for certified off-road engines are posted on-line at: <http://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 (STD) are not eligible for NRCS payments. Only FEL values equal to or lower than the emission standards are eligible.
- F) 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.
- G) Spark-ignition engines must meet the application emission standards established by the ARB.

- H) Replacement equipment must serve the same function and perform the same work equivalent as the existing equipment. Replacements intended to account for increases in production are not eligible. Acceptable examples are:
- (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.

- I) 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 cost-effective and 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.
- J) 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.
- K) The replacement engine must report at least a 15% NO<sub>x</sub> 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.
- L) 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.

- M) For electric equipment, the participant must include a description whether battery chargers have been installed. The participant shall describe the number of the battery chargers installed or to be installed.
- N) At this time, replacement with zero-emissions equipment other than electric (i.e. fuel cell equipment) is not eligible for payments.
- O) The 372 Practice Standard project life is 15 years; however a 10-year life will be used for calculating emissions and cost effectiveness. A cost effectiveness evaluation of the estimated emission reductions may be performed on a case-by-case basis using criteria similar to those specified in California's Carl Moyer program. The evaluation will determine whether the cost of replacing an engine and/or equipment significantly exceeds the emission reduction benefits.

### **Replacing More Than One Existing-Equipment for New Equipment:**

Significant air quality benefits can result if the new equipment is replacing more than one existing-equipment. All existing and new equipment must meet the eligibility requirements and are reviewed on a case-by-case basis. Not more than three existing units may be considered for the replacement of one unit.

Replacing up to three 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 estimated annual emissions from the new replacement engine from the sum of the annual emissions from the two or three subject existing engines.
- B) To be eligible, the new equipment must serve the same function and perform similar work as one of the existing equipment it's replacing. The other existing equipment may be different in type or perform functionality different to the new equipment.
- C) 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 similar function engine. The greatest hp rating of the existing engines may be used as the baseline hp. The hp from other existing equipment

that differ in type or function to the new equipment shall not be used for determining the baseline hp.

D) The summed emission reductions are used for ranking purposes. HP shall not be summed for determining a baseline hp rating for determining the maximum new engine hp limit.

E) 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 that also plans to operate about 500 hours/year. 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 (92 hp x 125%). The NOx emissions are:

Sum of existing engine emissions = 1.17 tons NOx/year

1979: 0.43 tons =  $\{(92 \text{ hp} \times 12.09 \text{ g/bhp-hr} \times 500 \text{ hrs/yr} \times 0.70)/907,200\}$

1985: 0.74 tons =  $\{(150 \text{ hp} \times 10.23 \text{ g/bhp-hr} \times 800 \text{ hrs/yr} \times 0.55)/907,200\}$

New engine emissions = 0.09 tons NOx/year

Tier 3: 0.09 tons =  $\{(105 \text{ hp} \times 2.32 \text{ g/bhp-hr} \times 500 \text{ hrs/yr} \times 0.70)/907,200\}$

Total NOx emission reductions = 1.08 tons/yr (92% NOx reduction)

(2) An existing 152 hp 1981 loader that operates 500 hours/year and an existing 125 hp 1975 loader that operates 900 hours/year will be retired for a new 160 hp Interim Tier 4 Phase-in loader that plans to operate about 700 hours/year. In this example, despite which equipment is directly replaced with the new, the maximum hp of the two like equipment may be applied as the baseline hp rating, thus limiting the maximum hp rating of the new equipment to 190 hp (152 hp x 125% = 190 hp). Applying the 125 hp engine instead would have limited the hp rating of the new to 156 hp, but because 160 hp is within the 125% of the highest rated hp, this project is eligible. The NOx emissions are:

Sum of the existing engines emissions = 1.23 tons NOx/year

1981: 0.47 tons =  $\{(150 \text{ hp} \times 10.23 \text{ g/bhp-hr} \times 500 \text{ hrs/yr} \times 0.55)/907,200\}$

1975: 0.76 tons =  $\{(125 \text{ hp} \times 11.16 \text{ g/bhp-hr} \times 900 \text{ hrs/yr} \times 0.55)/907,200\}$

New engine emissions = 0.15 tons NOx/year

Tier 4-I: 0.15 tons =  $\{(160 \text{ hp} \times 2.15 \text{ g/bhp-hr} \times 700 \text{ hrs/yr} \times 0.55)/907,200\}$

Total NOx emission reductions = 1.08 tons/yr (88% NOx reduction)

- (3) A single piece of equipment may utilize more than a single engine mounted on the unit. Such equipment outfitted with multiple engines operate together to perform a single function or task (such as a PTO on the propulsion engine plus a dedicated auxiliary engine). The horsepower from each engine may be summed to determine the overall existing horsepower baseline since this is the total hp needed to perform the function. However, hours of operations for each engine will differ since one engine is used to propel the equipment while the auxiliary engine is shut down. In this example, the total emissions calculated from each engine may be summed. The total maximum horsepower ratings for the new replacement equipment shall not exceed 125% of the summed horsepower of the existing equipment, even if the new equipment is outfitted with multiple engines. However, such proposals might result in the purchase of new equipment outfitted with a single engine.
- F) All existing engines and equipment used to achieve these 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 NO<sub>x</sub> or NO<sub>x</sub>+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 NO<sub>x</sub> or NO<sub>x</sub>+NMHC emissions by at least 15% from the applicable NO<sub>x</sub> or NO<sub>x</sub>+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 permanently destroyed and disposed of at a dismantling facility approved by the NRCS. The approved dismantler has the equipment to and will scrap the engine and equipment components either by shearing, crushing, or shredding. Disabled engines or equipment shall not be transported outside of California for final destruction, but may leave the state once it has been permanently destroyed and scrapped.
- (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,
- Provide a description on how the existing engine and equipment were destroyed, and
- 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.
- (G) It should be recognized that this certification is intended for NRCS contracts only. Using NRCS documents for other incentive programs may not be transferable.

## **Section 5: Applications, Instructions, and Certifications**

Several documents have been developed to assist the participant and NRCS staff.

### **(A) Supplemental Applications:**

The participant must complete and attach the two supplemental applications along with the CPA-1200 and the other program forms. The information provided will be used for determining priority and ranking for funding and payment eligibility purposes. In addition, the participant may attach maintenance records, receipts, ARB Executive Orders, estimates, or any additional information requested by NRCS staff. A complete application will take less time to process.

The following supplemental applications are:

1. Existing Engine Information
2. New Engine Information

### **(B) Destruction Certification:**

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 worksheet 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 can be used to generate a completed emissions calculation form. The emission factors provided through the State of California "Carl Moyer Memorial Air Quality Standards Attainment Program" guidelines are used for estimating emissions.



**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:

Irrigation Engine    Tractor    Loader    Harvester    Forklift    Other:

Report the total acres this engine serves:

Years operated on these acres:

Primary Fuel Type  
(check one):

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

Engine Type  
(check one):

- Non-Tier Diesel
- Tier 1
- Tier 2
- 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 – required for Tier 1 or Tier 2 diesel)

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:

- |                                  |                                   |                                    |
|----------------------------------|-----------------------------------|------------------------------------|
| <input type="checkbox"/> January | <input type="checkbox"/> February | <input type="checkbox"/> March     |
| <input type="checkbox"/> April   | <input type="checkbox"/> May      | <input type="checkbox"/> June      |
| <input type="checkbox"/> July    | <input type="checkbox"/> August   | <input type="checkbox"/> September |
| <input type="checkbox"/> October | <input type="checkbox"/> November | <input type="checkbox"/> December  |
- Operates throughout the year

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. **Report the annual total acres this engine serves:** Estimate the annual total acres of cropland this engine irrigates or the annual total acres the mobile equipment operates on.
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](http://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: Required for Tier-certified engines.** Include the certified engine family name assigned by the EPA and attach the applicable ARB Executive Order for this engine. This information should be available through your engine vendor or is on-line at: [www.arb.ca.gov/msprog/offroad/cert/cert.php](http://www.arb.ca.gov/msprog/offroad/cert/cert.php).
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.



**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 new engine will power:

Irrigation Engine    Tractor    Loader    Harvester    Forklift    Other:

Report the total acres this engine will serve:

Primary Fuel Type  
(check one):

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

Engine Type  
(check one):

- Tier 3
- Tier 4 Interim
- Tier 4 Final
- Spark Ignited
- Electric
- Other:

Verified Retrofit Technology:

- 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:

- |   |                                  |                                   |                                    |
|---|----------------------------------|-----------------------------------|------------------------------------|
| <input type="checkbox"/> Operates throughout the year | <input type="checkbox"/> January | <input type="checkbox"/> February | <input type="checkbox"/> March     |
|   | <input type="checkbox"/> April   | <input type="checkbox"/> May      | <input type="checkbox"/> June      |
|   | <input type="checkbox"/> July    | <input type="checkbox"/> August   | <input type="checkbox"/> September |
|   | <input type="checkbox"/> October | <input type="checkbox"/> November | <input type="checkbox"/> 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. **Report the annual total acres this engine will serve:** Estimate the annual total acres of cropland this engine will irrigate or the annual total acres the mobile equipment will operate on.
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](http://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: *Required*** by including the certified engine family name assigned by the EPA and attaching the applicable ARB Executive Order for this engine. This information should be available through your engine vendor or is on-line at: [www.arb.ca.gov/msprog/offroad/cert/cert.php](http://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 is not 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



**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, including 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:**

Destruction Company Name:

Address:

City:

State:

Zip Code:

Date engine/equipment was scrapped:

**The engine/equipment has been destroyed and scrapped.**

Destruction Facility Contact Name (Print):

Phone No:

Contact Signature:

Date:

**Please attach date stamped photographs of the disabled engine/equipment identifying 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.**



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 <sub>maximum</sub>
Annual Hours of Operation:	<b>X</b> _____	_____	_____	_____	Hours/Year
Emission Factors:	<b>X</b> _____	_____	_____	_____	g/bhp-hr
Load Factor:	<b>X</b> _____	_____	_____	_____	
Conversion to Tons:	÷ <b>907,200</b>	<b>907,200</b>	<b>907,200</b>	<b>907,200</b>	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 <sub>maximum</sub>
Annual Hours of Operation:	<b>X</b> _____	_____	_____	_____	Hours/Year
Emission Factors:	<b>X</b> _____	_____	_____	_____	g/bhp-hr
Load Factor:	<b>X</b> _____	_____	_____	_____	
Conversion to Tons:	÷ <b>907,200</b>	<b>907,200</b>	<b>907,200</b>	<b>907,200</b>	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 engines to establish a baseline and from the new engines. An emissions inventory will be developed based on this data to estimate the annual emissions of NO<sub>x</sub>, ROG (NMHC or VOC), and PM<sub>10</sub> and to calculate the emission reductions that results from implementing this conservation practice.

### ***Emissions Calculations***

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

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

**Table 1**  
**Diesel Equipment Default Load Factors**

Tillers	0.78	Crawler Tractors	0.43
Combines	0.70	Mowers	0.43
Tractors	0.70	Shakers	0.43
Irrigation Pumps	0.65	Forage Harvesters*	0.43
Bailers	0.58	Graders	0.41
Loaders/Backhoes	0.55	Rough Terrain Forklifts	0.40
Swathers	0.55	Forklifts	0.20
Sprayers	0.50	Other Agricultural	0.51
Hydro Power Units	0.48		

Source: 2011 Carl Moyer Program Guidelines, Table D-10  
 \* Mowers EF

**Table 2**  
**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	0.605
	1988 – 1995	8.14	1.19	0.497
120 +	Pre 1970	13.02	1.59	0.554
	1970 – 1979	11.16	1.20	0.396
	1980 – 1987	10.23	1.06	0.396
	1988 – 1995	7.60	0.82	0.274

Source: 2011 Carl Moyer Program Guidelines, Table D-11

**Table 3**  
**Controlled Off-Road Compression-Ignition (Diesel) Engines**  
**Emission Factors (g/bhp-hr)**

Horsepower	Tier	NOx	ROG	PM10
50-74	1	6.54	1.19	0.552
	2	4.75	0.23	0.192
	3	2.74	0.12	0.192
	4 Interim	2.74	0.12	0.112
	4 Final	2.74	0.12	0.008
75-99	1	6.54	1.19	0.552
	2	4.75	0.23	0.192
	3	2.74	0.12	0.192
	4 Phase-Out	2.74	0.12	0.008
	4 Phase-In/ Alternative NOx	2.14	0.11	0.008
	4 Final	0.26	0.06	0.008
100-174	1	6.54	0.82	0.008
	2	4.17	0.19	0.128
	3	2.32	0.12	0.112
	4 Phase-Out	2.32	0.12	0.008
	4 Phase-In/ Alternative NOx	2.15	0.06	0.008
	4 Final	0.26	0.06	0.008
175-299	1	5.93	0.38	0.108
	2	4.15	0.12	0.088
	3	2.32	0.12	0.088
	4 Phase-Out	2.32	0.12	0.008
	4 Phase-In/ Alternative NOx	1.29	0.08	0.008
	4 Final	0.26	0.06	0.008
300-750	1	5.93	0.38	0.108
	2	3.79	0.12	0.088
	3	2.32	0.12	0.088
	4 Phase-Out	2.32	0.12	0.008
	4 Phase-In/ Alternative NOx	1.29	0.08	0.008
	4 Final	0.26	0.06	0.008
751+	1	5.93	0.38	0.108
	2	3.79	0.12	0.088
	4 Interim	2.24	0.12	0.048
	4 Final	2.24	0.06	0.016

Source: 2011 Carl Moyer Program Guidelines, Table D-12

**Table 4**  
**Off-Road Large Spark-Ignited Equipment Default Load Factors**

Combines	0.74	Sprayers	0.50
Rough Terrain Forklifts	0.63	Loaders/Backhoes	0.48
Tractors	0.62	Forklifts	0.30
Balers	0.55	Other Agricultural	0.55
Swathers	0.52		

Source: 2011 Carl Moyer Program Guidelines, Table D-13

**Table 5**  
**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: 2011 Carl Moyer Program Guidelines, Table D-14