

# Diesel Emissions Reduction Program (DERA): Technologies, Fleets and Projects Information

Working Draft Version 1.0



National Clean Diesel Campaign

Working Together for Cleaner Air

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Transportation and Climate Division  
Office of Transportation and Air Quality  
U.S. Environmental Protection Agency

## **Diesel Emissions Reduction Program: Technologies, Fleets and Projects Information & Tips for EPA Project Officers & Staff**

### **Introduction**

EPA's diesel emission reduction program offers grant funding to eligible entities on a competitive basis, with the goal of reducing diesel emissions and improving efficiency nationwide. Grant funding for this program is typically authorized under the Energy Policy Act Subtitle G, commonly referred to as the Diesel Emissions Reduction Act (DERA). This document is designed to provide information to EPA Regional Project Officers, EPA Technical Staff and Grantees to help manage DERA grants and document important points.

This document is not a substitute for grant requirements. Project officers and grantees must be familiar with the Request for Proposals (RFP), project narrative or work plan, grant terms and conditions as well as other grant, programmatic or regulatory requirements. This information is intended to emphasize and clarify some important points, provide examples, serve as a quick reference for individuals who may not be familiar with clean diesel projects and highlight lessons learned for everyone.

### **How to Use this Document:**

This document is divided into sections, based on the typical types of clean diesel projects included in DERA grants. Each section gives general information about that specific technology or activity, points out specific items to look for concerning that technology or activity and provides checklists that detail the type of documentation that should be kept in either the EPA Project Officer's or Grantee's files.

This document should be read and used by EPA Project Officers and grantees, or others working with DERA grants.

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# 1. Vehicle Categorizations

This document categorizes diesel vehicles into 4 main types: on-highway, nonroad, marine and locomotives.

To be eligible for DERA grants, on-highway vehicles must be equipped with medium heavy-duty or heavy heavy-duty certified engines. These engines are used in Class 5, 6, 7 and 8 vehicles, such as school and transit buses, refuse haulers, short haul trucks, long haul trucks, emergency and service vehicles. Note: all school buses are eligible for DERA grants, regardless of the Class that the particular school bus falls into. See Figure 1 below for examples of all Class types.

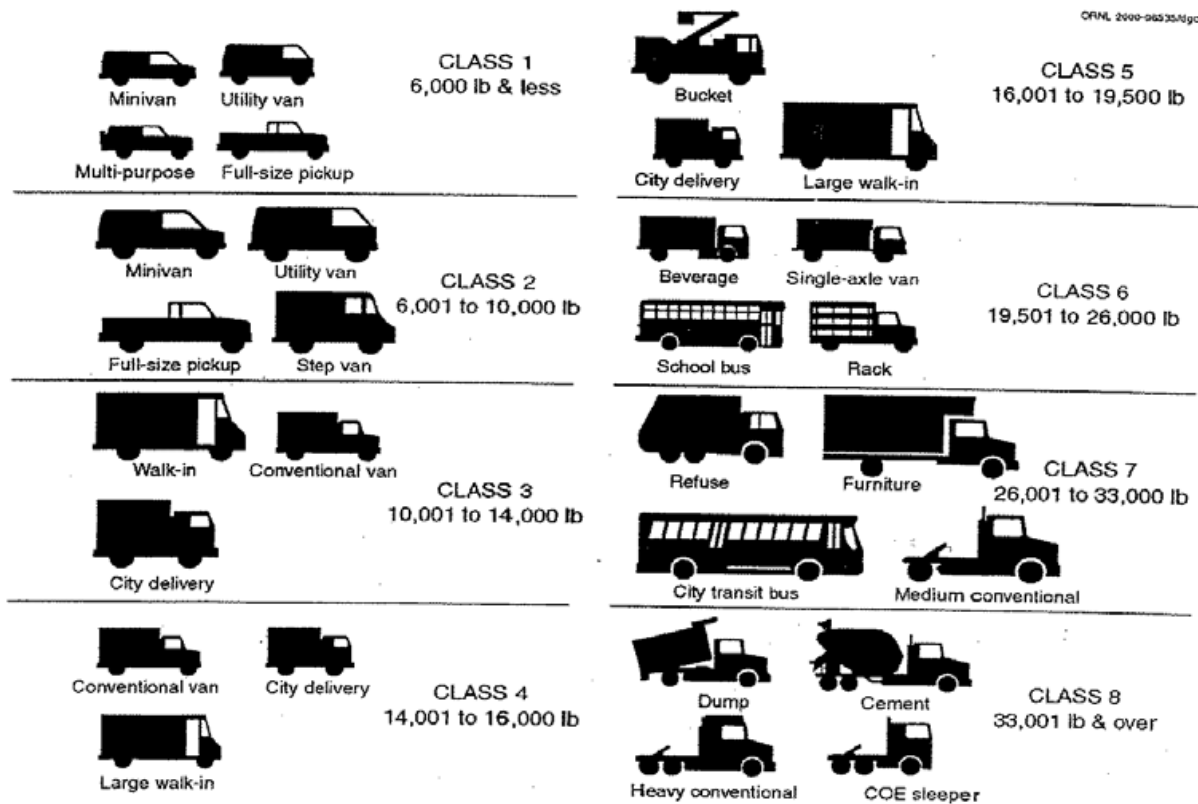


Fig. 1. Truck types by gross vehicle weight (GVW). Source: *Commercial Carrier Journal* (<http://www.ccmagazine.com>).

Nonroad vehicles include those used in construction, handling of cargo at a port or airport, agriculture, mining, or energy production (including stationary generators or pumps).

Marine vessels may have one or more engines for propulsion and/or auxiliary power.

Locomotives may include line-haul or switcher locomotives.

## **2. Exhaust Controls**

### **a. General Information**

Exhaust emission controls (often called aftertreatment technologies) include pollution control devices installed in the exhaust system. Aftertreatment technologies are some of the most common retrofit technologies because many can be added to the exhaust system of a vehicle or nonroad machine with little or no impact on engine operation. Common types of exhaust controls include:

- Diesel oxidation catalyst (DOC)
- Diesel particulate filter (DPF)
- Partial flow filter (PFF)
- Selective catalytic reduction (SCR) system

Note: Some engines are originally equipped with aftertreatment technologies from the engine manufacturer. An engine originally equipped with a DOC may not be used in a DOC retrofit project. Additionally, engines originally equipped with a DOC may not be acceptable for some PFF or DPF technologies, so you must consult the specific technology verification requirements. Many engines produced from 2002 to 2006 for use in school buses were originally equipped with a DOC.

### **b. Things to look for in these types of projects**

1. *Ensure technology is verified:* In order for exhaust controls to be eligible for DERA funding, the technology must be specifically named on either the EPA Verified Technology List or the California Air Resources Board (CARB) Verified Technology List. Check to ensure the specific technology (by name, model and manufacturer) is on one of these lists AND is specified to be used with the specific vehicle application in your project. In addition, confirm the technology is verified to be used on the vehicle or equipment type and for the applicable model year.

*EPA Verified Technology List:* <http://epa.gov/cleandiesel/verification/verif-list.htm>

*CARB Verified Technology List:* <http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm>

2. *Check EPA Verification Letter or CARB Executive Order and Attachment:* For each technology verified by either EPA or CARB, consult the list for guidance regarding use of the technology. When using EPA verified technologies, refer to the EPA Verification Letter to confirm applicability and required operating criteria for each installation. CARB verified technologies must be used in accordance with the Executive Order (EO) letter, and the engine to be retrofitted must be confirmed as acceptable with the associated Attachment to the EO. A sample letter for one of the Verified Technologies can be found at <http://epa.gov/cleandiesel/documents/verif-letter-cat2.pdf>. For each specific technology, read these documents to ensure the technology is intended for use in the specific vehicle application within your project. Both of these documents can be accessed through the Verified Technology Lists above, by clicking on a specific technology on the list.

3. *Ensure datalogging is completed for all proposed vehicles (for DPF and PFF projects):* It is critically important that passive DPFs and PFF technologies achieve exhaust temperatures required for proper operation. All potential vehicles must therefore be datalogged to ensure the exhaust temperature is high enough for an adequate percentage of time as described for the specific retrofit technology. (Data logging information on a ‘representative sample’ may not be adequate to ensure the specific vehicle will work with this technology.) Active DPFs are a more expensive option, but may not require the exhaust to reach a certain temperature. When a DPF regenerates, accumulated soot is burned within the filter, but if exhaust temperatures are not adequate with a passive filter or if an active filter is not regenerated, a DPF may accumulate excessive soot which can lead to engine or filter problems. Note that in areas with significantly different seasonal temperatures, it may be advisable to data log vehicles during cold seasons or at least make sure adequate consideration is made for seasonal differences. For additional information on DPF operation, installation and maintenance, see available publications at [www.epa.gov/cleandiesel](http://www.epa.gov/cleandiesel).
4. *Ensure that contract bid requests are written correctly so that an appropriate technology is purchased and installed.* Grantees should require bids from technology vendors to include copies of the specific verification approval(s) from EPA and/or CARB so the grantee may confirm technology eligibility. Contract requirements should specify that vendors must provide documentation approving vehicle condition, compliance with technology verification criteria and showing data logging results and analysis for vehicles to be equipped with devices that have exhaust temperature criteria. In addition, the bid specifications should refer back to the specific RFP that the project is funded under, to ensure all program requirements are met. Note: EPA does not approve contracts or contract language. It is the responsibility of the grantee to ensure contracts are written to ensure the success of the project, within program requirements.
5. *Maintenance:* Exhaust controls may require periodic maintenance, and there may be unique installation criteria for different technologies. Exhaust emission control devices are heavier than conventional muffler systems and will likely require stronger mounting brackets. DPFs will require periodic ash cleaning and it is important to monitor maintenance as changes in maintenance needs can be an indication of other engine or system problems. SCR technologies require periodic refilling of diesel exhaust fluid (DEF) for proper system operation. DPF and SCR systems include driver notification systems that must be monitored for proper system operation and potential notice of maintenance needs.
6. *Document vehicle condition prior to retrofit:* In order for retrofit devices to operate properly, grantees should ensure that the original vehicle is in the proper condition prior to installation. Grantees should get written confirmation from the installer for each vehicle that it is in an acceptable condition at the time of retrofit. This documentation will also be useful to troubleshoot any technical issues after installation. See Appendix F for an example checklist.

### **c. EPA Project Officer File Checklist**

In addition to normal grant-management documents, Project Officers should specifically keep the following documentation in their files for projects which incorporate after-treatment Exhaust Controls:

- Completed Project Fleet Description Spreadsheets: Ensure relevant information is accurately completed, including the model name of the device, the year the retrofit takes place, the model year of the engine, etc . Note changes to the proposed fleet and, as it becomes available, any more detailed vehicle information relative to the RFP and technology requirements.
- Copies of either the EPA Verification Letter or the CARB Executive Order for the specific technologies used in the project (see section 2.b.1 above, for reference and the website where these documents are located). A screen shot of the letter from the website is acceptable.
- Copy of the Request for Proposals, in order to document that the correct percentage funding amount for this type of project is applied.

### **d. Grantee File Checklist**

In addition to normal grant-management documents, grantees should specifically keep the following documentation in their files for projects related to Exhaust Controls:

- Completed Project Fleet Description Spreadsheets: Ensure relevant information is accurately completed using instructions tab. Ask Project Officer for assistance, if needed. At the time of technology installation, grantee should also record the date and mileage of the vehicle.
- If vehicles are added or changed, the fleet description must be updated. Confirm that each new or different vehicle is acceptable meeting the RFP, project and technology requirements.
- Copies of either the EPA Verification Letter or the CARB Executive Order for the specific technologies used in the project.
- Documents from vendors regarding inspection of vehicles and acceptability of the engine and vehicle condition.
- Request for Proposals/Bids for equipment specifying equipment name, model, make, year, for which engine family and model years, etc.
- For DPF and PFF projects, retain datalogging results and analysis showing that each vehicle complies with exhaust temperatures required for the technology.
- For DPF projects that utilize active regeneration strategies, maintain instructions and records documenting the regeneration schedule as well as any other maintenance with copies of vehicle records.
- For SCR projects: Diesel exhaust fluid (DEF or urea) must be used with SCR systems. Records of urea use must be maintained for an ongoing basis. The EPA recommends the use of an American Petroleum Institute certified DEF; a local retailer may be found using the following link: <http://apidef.org/>.
- Invoices of all completed work. See Appendix A for an example of a good invoice for exhaust control technologies. For all technologies installed, invoices should include:
  - Technology type

- Technology make
  - Technology model
- Helpful information and tips are included under the “Technologies – Diesel Retrofit Devices” section at <http://www.epa.gov/cleandiesel/technologies/retrofits.htm>.



### **3. Crankcase Emission Controls**

#### **a. General Information**

Crankcase emission controls are technologies that filter gasses, particles and oil from the original crankcase vent tube so they are not released into the atmosphere. Crankcase emission controls are often called closed crankcase ventilation (CCV) system when the filtered gases are routed back into the engine intake. EPA and CARB have only verified closed crankcase emission control systems, and only verified CCV systems may be used. CCV systems are verified in conjunction with other aftertreatment technologies and must be used as a complete verified system.

#### **b. Things to look for in these types of projects**

1. *Ensure technology is verified:* In order for CCV systems to be eligible for DERA funding, the technology must be specifically named on either the EPA Verified Technology List or the California Air Resources Board (CARB) Verified Technology List. Check to ensure the specific technology (by name, model and manufacturer) is on one of these lists AND is specified to be used with the specific vehicle application in your project.

EPA Verified Technology List: <http://epa.gov/cleandiesel/verification/verif-list.htm>

CARB Verified Technology List: <http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm>

2. *Check EPA Verification Letter or CARB Executive Order:* Like the aftertreatment technologies described above, the verified CCV system should be compared to the applicable verification documentation. The CCV and associated aftertreatment technology must meet all requirements of the verification letter or EO.
3. *Ensure that contract bid requests are written correctly so that an appropriate technology is purchased and installed.* Only EPA or CARB verified CCV systems may be used, and they must be used in conjunction with the applicable verified aftertreatment technology. Grantees should require bids from technology vendors to include copies of the specific verification approval(s) from EPA and/or CARB so the grantee may confirm technology eligibility. Contract requirements should specify that vendors must provide documentation; approving vehicle condition, compliance with technology verification criteria
4. *Maintenance:* Crankcase devices require periodic maintenance, and there may be unique installation criteria for different crankcase emission control systems. It is important to monitor and document engine and crankcase system maintenance as changes in maintenance needs can be an indication of other engine or system problems.
5. *Catch bottles:* Rather than routing filtered gasses back to the engine intake, some vendors recommend using a “catch bottle” in certain vehicle installations. Catch bottles require additional maintenance and have been installed in unsafe locations.

The use of “catch bottles” is not currently approved by EPA or CARB, and they may not be used in DERA grants until it is explicitly addressed on EPA’s or CARB’s verified technology list.

6. *Document vehicle condition prior to retrofit:* In order for retrofit devices to operate properly, grantees should ensure that the original vehicle is in the proper condition prior to installation. This documentation will also be useful to troubleshoot any technical issues after installation. Engines with excessive blow-by emissions may be in poor condition and not acceptable for retrofit. Also, excessive blow-by emissions can overwhelm a CCV system and cause other engine problems.
7. *Check engine model year to ensure eligibility:* All on-highway engines manufactured after 2007 incorporate crankcase emission control technologies.

#### **c. EPA Project Officer File Checklist**

Because CCV systems are only verified in conjunction with aftertreatment technologies, review the applicable information above. In addition to normal grant-management documents, Project Officers should specifically keep the following documentation in their files for projects which incorporate aftertreatment Exhaust Controls:

- Copies of either the EPA Verification Letter or the CARB Executive Order, documenting the specific CCV and aftertreatment technology.

#### **d. Grantee File Checklist**

Because CCV systems are only verified in conjunction with aftertreatment technologies, review the applicable information above. In addition to normal grant-management documents, grantees should specifically keep the following documentation in their files for projects related to Exhaust Controls:

- Copies of either the EPA Verification Letter or the CARB Executive Order for the specific CCV technologies used in the project.
- Helpful information and tips are included under the “Technologies – Diesel Retrofit Devices” section at <http://www.epa.gov/cleandiesel/technologies/retrofits.htm>

## **4. Idle Reduction Technologies**

### **a. General Information**

Idle reduction technologies reduce unnecessary idling of the main drive engine of diesel vehicles or equipment and/or are designed to provide services (such as heat, air conditioning, and/or electricity) to vehicles and equipment that would otherwise require the operation of the main drive engine while the vehicle is temporarily parked or remains stationary. Common types of idle reduction technologies include:

- Electrified Parking Spaces (truck stop electrification)
- Shore Connection Systems and Alternative Maritime Power
- Shore Connection Systems for Locomotives
- Auxiliary Power Units (APU) and Generator Sets
- Fuel Operated Heaters
- Battery Air Conditioning Systems
- Thermal Storage Systems
- Automatic Shut-down/Start-Up Systems

### **b. Things to look for in these types of projects**

1. *Ensure technology is verified for the specific application:* In order for idle reduction technologies to be eligible for DERA funding, the technology must be specifically named on the EPA Verified Idle Reduction Technology List. Check to ensure the specific technology (by name, model and manufacturer) is on the list AND is specified to be used with the specific vehicle application in your project.

EPA Verified Idle Reduction Technology List:

<http://www.epa.gov/smartway/technology/>

2. *APU Restrictions:* EPA defines APUs as devices that contain an EPA emission-certified engine and supply cooling, heating, and electrical power to Class 8 trucks and other applications. APUs currently verified for on-highway vehicles are only for long-haul class 8 trucks which means the truck must have specific capabilities and have a sleeper cab. At this time APUs and generators are not eligible for FY 2011 National DERA funding when used on long haul Class 8 vehicles powered by 2007 or newer certified engine configurations. EPA is currently testing and reviewing the use of APUs and generators on long haul Class 8 vehicles powered by 2007 and newer certified engine configurations. APUs and generators are eligible for funding when used on long haul Class 8 vehicles powered by 2006 and older certified engine configurations. Note: Battery Air Conditioning Systems and Fuel Operated Heaters are not categorized as APUs based on EPA's definition, and are therefore not subject to the above APU restrictions.
3. *Ensure that contract bid requests are written correctly so that an appropriate technology is purchased and installed.* Bids from technology vendors should include the specific technology name from EPA's website so the grantee may confirm

technology eligibility. Contract requirements should specify that vendors must provide documentation showing the device is verified for the specific vehicle.

#### **c. EPA Project Officer File Checklist**

In addition to normal grant-management documents, Project Officers should specifically keep the following documentation in their files for projects related to Idle Reduction Technologies:

- Completed Project Fleet Description Spreadsheets: Ensure relevant information is accurately completed, including the model name of the device, the year the project takes place, the model year of the engine, etc.
- APUs and generator sets are only eligible for Class 8 long haul trucks with engines that are 2006 or older, if funded with FY11 funds. Confirm the engine year and that the truck is a Class 8 long haul. A Class 8 long haul truck will have a sleeper cab and gross vehicle weight rating over 33,000 pounds.
- Copy of the Request for Proposals to document that the correct percentage funding amount for this type of project is applied.

#### **d. Grantee File Checklist**

In addition to normal grant-management documents, grantees should specifically keep the following documentation in their files for projects related to Idle Reduction Technologies:

- Completed Project Fleet Description Spreadsheets: Ensure relevant information is accurately completed, using instructions tab. Ask your Project Officer for assistance, if needed. At the time of technology installation, grantee should also record the date and mileage of the vehicle.
- Request for Proposals/Bids for equipment and invoices that specify the equipment name, model, make, year, for which engine family and model years, etc.
- Invoices of all completed work. See Appendix A for an example of a good invoice for exhaust control technologies. For all technologies installed, invoices should include:
  - Technology type
  - Technology make
  - Technology model
- It is recommended to install exhaust control technologies before idle reduction technologies to confirm acceptable installation and funding level.

## **5. Engine Repowers**

### **a. General Information**

In an engine repower, the existing engine is removed and replaced with a newer, cleaner engine configuration that meets a more stringent set of engine emissions standards. Engine repowers may use new engine configurations certified to emission standards or remanufactured engines representative of a previously certified engine configuration. Note: Engine Certification data and information can be found at <http://www.epa.gov/otaq/certdata.htm>.

### **b. Things to look for in these types of projects**

1. *Replacement engine selection:* All replacement engines MUST be in a certified configuration. If the replacement engine is a remanufactured engine, documentation must show the previously certified EPA engine family name represented by the certified configuration. If the replacement engine was certified with exhaust aftertreatment such as a DOC or DPF, new parts must be installed to complete the certified engine configuration.
2. *Check pre-and post-emission standard levels for PM and NOx:* Newer engines or higher tier engines are not necessarily cleaner engines, so it is important to check the actual emission standard level of the current (existing) and new engines to ensure the repower product is reducing emissions for PM and NOx. Emission standard levels are based on the engine model year for on-highway engines, and for nonroad engines the horsepower and model year of the engine will determine the tier level. Check the emissions tables found in the applicable link below to ensure that the proposed repower will result in an emissions reduction.

On-Highway Emissions Standards Tables: See Appendix B for a quick reference or <http://www.epa.gov/otaq/standards/heavy-duty/hdci-exhaust.htm>

Nonroad Emissions Standards Tables: See Appendix C for a quick reference or <http://www.epa.gov/otaq/standards/nonroad/nonroadci.htm>

Locomotive Emissions Standards Tables:  
<http://www.epa.gov/otaq/standards/nonroad/locomotives.htm>

Marine Emissions Standards Tables:  
<http://www.epa.gov/otaq/standards/nonroad/marineci.htm>

3. *Certificates of conformity:* Grantees should obtain copies of certificates of conformity for existing and new engines from the engine manufacturers prior to repowering the engine. If the existing engine is unregulated, however, it will not have a certificate of conformity and documentation of the engine age is acceptable. Be aware that many new and existing vehicles have certified engine configurations that may include aftertreatment technologies or other requirements such as aftercooling. When conducting a repower, the entire configuration needs to be replaced, which must

- include a complete engine and emission control system to the design specifications of the certified engine configuration.
4. *Ensure old engine is scrapped or appropriately remanufactured:* After repower, the old engine must be rendered permanently disabled or returned to the original engine manufacturer to be remanufactured to the next lower (cleaner) EPA emission standard level. Evidence of proper disposal (such as engine serial number and vehicle identification number) must be provided in the Final Report submitted to the EPA Project Officer. Check to ensure that the old engine is indeed returned to the engine manufacturer or that it has been retired from use and is no longer operable. If components from the old engine are sold for parts, program income requirements will apply. Confirm with the RFP for specific scrappage or remanufacturing requirements that may be applicable.
  5. *Invoices should be very specific and include all the parts of the certified engine configuration:* Sometimes a critical part of the new certified engine is the catalyst (from an emissions reduction standpoint). Ensure that the entire configuration is installed according to the engine manufacturer's specifications by having the vendor document this on the invoice. See Grantee File Checklist section, below, for a list of items that should be included on repower invoices.
  6. *Early Repower:* Repowers that would have occurred through normal attrition are considered to be the result of normal fleet turnover and are not eligible for funding under this program. Normal attrition is generally defined as a repower that is scheduled to take place before the end of the project period. Normal attrition is typically defined by the vehicle or fleet owner's budget plan, operating plan, standard procedures, or retirement schedule. For example, if a vehicle fleet typically repowers engines after 15 years, an engine that is currently in its 13<sup>th</sup> or 14<sup>th</sup> year of service is not eligible for a repower, since it is already scheduled to be repowered within the 2 year project period. An engine that is currently in its 12<sup>th</sup> year of service and has 3 years of normal life remaining before typically scheduled for a repower (as defined by the fleet's retirement schedule) is eligible for a repower, since it is not already scheduled to be repowered during the 2 year project period; however, it may not be the best choice to select an engine so close to the end of its life. It is important to confirm that vehicles and vehicle selection criteria proposed in a workplan are followed during the project, and vehicles with a shorter remaining life are not substituted. In addition, the original engine and equipment must be in fully operational and performing its intended function to qualify for funding.
  7. *Operating condition:* As described above, to be eligible for repower projects, the original engine must be fully operational and performing its intended function to qualify for funding. Vehicles or engines that are not operating in normal service may not be used in repower projects.
  8. *Selection of vehicles or equipment:* The most cost effective vehicles or equipment will have high annual use (>1000 hours or 50,000 miles).

9. *Note for on-highway repowers:* Some new technology engines may not be acceptable for use in older trucks. For example, a 2005 engine equipped with exhaust gas recirculation (EGR) may require additional engine cooling and may have installation requirements that prohibit use in older trucks.
10. *Note for nonroad repowers:* The phase-in of emission standards for nonroad engines is different depending on the power rating of the engine. The standards levels change with different Tiers and engine power rating. Consequently, it may be necessary to confirm that the original and repower engine falls within the same power rating to know the applicable emission standard level and Tier differences. Further, the standard levels between some Tiers may only differ in one pollutant. Early unregulated nonroad engines are referred to as Tier 0 and the cleanest nonroad engines are Tier 4. There may be little difference between a Tier 0 and Tier 1 engine.
11. *Note for locomotive and marine repowers:* Depending on the availability of certified engine rebuild kits, regulations may require that marine engines at or above 600 kW and locomotive engines be upgraded to a lower emission level at the time of rebuild. Consequently, a repower project in a marine or locomotive application may overlap with an operator's requirement to install a certified engine upgrade kit at the time of rebuild. In this case, the project could be considered a mandated measure, and may not be fundable under the DERA program. It is appropriate to confirm that a marine or locomotive engine replacement project is not simply going to achieve the same benefit already required with a certified engine upgrade kit. Identify when the original locomotive or marine engine was rebuilt last, when it is due for rebuild next, and if a certified rebuild kit is available. For additional information, ask your Project Officer for assistance.
12. *Note for alternative fuel repowers, including hybrid, plug-in and electric vehicles:* Conventional original equipment manufacturer (OEM) vehicles altered to operate on propane, natural gas, methane gas, ethanol, or electricity are classified as aftermarket alternative fuel vehicle (AFV) conversions. In the United States, all vehicle conversions (except pure battery electric vehicles) must meet applicable U.S. Environmental Protection Agency (EPA) standards. Vehicles operating in California must follow conversion rules issued by the California Air Resources Board (CARB). EPA issues Certificates of Conformity that cover a "test group"—specific vehicle or engine models for certain model years that are modified to operate on an alternative fuel. An aftermarket conversion may only be performed on a vehicle if a Certificate of Conformity or CARB certification has been issued for that vehicle's test group. The EPA refers to a vehicle converter as a "small volume manufacturer." The vehicle converter holds the Certificate of Conformity. An individual or entity wishing to convert a vehicle to operate on an alternative fuel must go through a company or organization associated with a certificate holder, and the work must be performed by a licensed technician associated with that company. It is the responsibility of the certificate holder to ensure the equipment is properly installed. Only certified alternative fueled engines are acceptable, the EPA engine family must be

documented, and all applicable regulatory procedures must be followed in the conversion.

If the conversion is accomplished by applying a certified conversion “kit” to an existing diesel engine, the project is considered an engine upgrade. If the conversion is accomplished by removing and scrapping the existing diesel engine and fueling system and replacing it with a certified AFV engine configuration, the project is considered a repower. If the entire diesel vehicle is scrapped and replaced with an entire new AFV, the project is considered a vehicle replacement.

Technologies for the electrification of engines/vehicles/equipment other than those specifically listed in the RFP as idle-reduction technologies may be eligible as a Repower (removal of a diesel engine and its replacement with an electric power source) or a Replacement (replacement of a diesel powered vehicle/equipment with an eligible electric vehicle/equipment). All -electric (zero emission) conversions do not require EPA or CARB certification.

There are currently no verified hybrid drive train retrofits or certified hybrid upgrade/conversion kits, therefore hybrid conversions are not eligible for funding. Hybrid vehicles are eligible as vehicle replacements.

Straight vegetable oil (SVO) is not an EPA-registered fuel and is not eligible for funding. Conversion kits to run an engine on SVO are not certified and are not eligible for funding. New vehicles/engines and unverified equipment that run on SVO are not eligible for funding.

#### **c. EPA Project Officer File Checklist**

In addition to normal grant-management documents, Project Officers should specifically keep the following documentation in their files for projects related to Engine Repowers:

- Completed Project Fleet Description Spreadsheets: Ensure relevant information is accurately completed. Pay special attention to engine details (not to be confused with vehicle details), including but not limited to: make, model, rating, engine family, and horsepower.
- Confirm the fleet description documents the original standard or tier level and that the repower achieves the proposed level of reduction described in the project description.
- Documentation of original engine being scrapped (e.g., written documents and photos) should be provided by the grantee in its Final Report.

#### **d. Grantee File Checklist**

In addition to normal grant-management documents, grantees should specifically keep the following documentation in their files for projects related to Engine Repowers:

- Completed Project Fleet Description Spreadsheets: Ensure relevant information is accurately completed using instructions tab. Ask Project Officer for assistance, if needed.



- Document that each vehicle is performing its intended function and that the original engine(s) are fully operational and not already due for replacement or rebuild. This should include documentation of daily miles driven or hours of operation.
- When requesting bids for replacement engines, require documentation that a certified engine configuration will be installed, including all components such as after treatment devices and emission control technologies.
- Invoices of all completed work. See Appendix A for an example of a good invoice. Invoices for repowers should include:
  - The specific engine configuration installed, including the model year or tier level
  - A list of all parts included in the repower, especially any exhaust controls.
- Copies of EPA certificates of conformity for existing and new engine configurations, and confirm the EPA engine family names match the certificates.
- Evidence that the old engine was rendered permanently disabled or returned to the original engine manufacturer to be remanufactured to the next EPA standard. Refer to the RFP for specific remanufacturing instructions. Documentation should include the engine serial number and vehicle identification number, and may also include photos illustrating how the engine was disabled. If returned to the engine manufacturer, obtain a letter documenting that the engine is remanufactured to a more stringent EPA standard.
- For locomotive or marine engine projects, fully address and document the points in section b.9., above, regarding the original engine, rebuild history, and availability of rebuild kits.
- For marine and locomotive engine projects, print current lists of certified rebuild kits to document that no kits are currently available. If a kit is available, document how the project is acceptable according to RFP requirements.

## **6. Vehicle and Equipment Replacements**

### **a. General Information**

Vehicle or equipment replacement is designed to obtain emission reductions by removing old, high-emitting vehicles or equipment from service and replacing them with newer, cleaner vehicles or equipment.

### **b. Things to look for in these types of projects**

1. *Early Replacement:* Replacements that would have occurred through normal attrition are considered to be the result of normal fleet turnover and are not eligible for funding under this program. Normal attrition is generally defined as a replacement that is scheduled to take place before the end of the project period. Normal attrition is typically defined by the vehicle or fleet owner's budget plan, operating plan, standard procedures, or retirement schedule. For example, if a school bus fleet typically retires vehicles after 20 years, a bus that is currently in its 18<sup>th</sup> or 19<sup>th</sup> year of service is not eligible for replacement, since it is already scheduled to be replaced within the 2 year project period. A bus that is currently in its 17<sup>th</sup> year of service and has 3 years of normal life remaining (as defined by the fleet's retirement schedule) is eligible for replacement, since it is not already scheduled to be replaced during the 2 year project period; however such a short time before normal fleet turnover would not be a most desirable project. Keep in mind that projects may be delayed and a short time before normal fleet turnover may quickly be exceeded by a delay in delivering new equipment. In addition, original equipment must be in operational condition to qualify for funding.  
The most cost effective vehicles or equipment will have high annual use (>1000 hours or 50,000 miles), and the replacement would occur well in advance of the normal fleet turnover.
2. *Replacement Requirements:* The replacement vehicle or equipment *must serve the same function* as the original vehicle or equipment. The replacement vehicle or equipment *must have the same gross vehicle weight rating and similar horsepower* as the original vehicle or equipment. In addition, the vehicle/equipment must be maintained in accordance with manufacturer specifications.
3. *The original vehicle or equipment must be performing its intended function:* Vehicles and equipment must be working properly and performing normal duty service to be eligible for replacement. Vehicles or equipment with reduced operation from normal fleet service are not eligible.
4. *Ensure old vehicle or equipment is scrapped or remanufactured:* When the original vehicle/equipment is retired, it must be rendered permanently disabled or the engine must be returned to the original engine manufacturer to be remanufactured to the next EPA standard. Drilling a hole in the engine block and manifold and disabling the chassis while retaining possession of the vehicle/equipment is an acceptable scrapping method. Evidence of proper disposal (such as engine serial number and

vehicle identification number) must be provided. Check to make sure that the old vehicle/equipment is indeed retired from use and the vehicle/equipment is no longer operable. Equipment and vehicle components that are not part of the engine or chassis may be salvaged from the unit being replaced (e.g. plow blades, shovels, seats, tires, etc.) If scrapped or salvaged vehicles/parts are to be sold, program income requirements will apply. Note: refer to the award terms and conditions for specifications regarding scrapping and remanufacturing requirements.

5. *Certificates of conformity:* Grantees should obtain copies of EPA certificates of conformity for existing and new engines from the engine manufacturers prior to replacing the vehicle. However, if the existing engine is unregulated, it will not have a certificate of conformity. The certificate of conformity lists the engine family name and the engine model year. The EPA engine family name is displayed on the emission control information label on the engine. By checking the engine family names and engine model year emission standards, one can confirm the applicable emission standard or tier level.

#### **c. EPA Project Officer File Checklist**

In addition to normal grant-management documents, Project Officers should specifically keep the following documentation in their files for projects related to vehicle or equipment replacements:

- Completed Project Fleet Description Spreadsheets: Ensure relevant information is accurately completed. Pay special attention to engine details (not to be confused with vehicle details), including but not limited to: make, model, rating, engine family, and horsepower.
- Documentation of original vehicle being scrapped (e.g., written documents and photos) should be provided by the grantee in its Final Report.
- Document and confirm the original and replacement engine standard levels achieve the reduction proposed.

#### **d. Grantee File Checklist**

In addition to normal grant-management documents, grantees should specifically keep the following documentation in their files for projects related to vehicle and equipment replacements:

- Completed Project Fleet Description Spreadsheets: Ensure relevant information is accurately completed, using instructions tab. Ask Project Officer for assistance, if needed.
- Document that each vehicle is performing its intended function and that the original vehicle(s) are fully operational and not already due for replacement.
- Document fleet turn-over practices through historic records. Document age of vehicles to be replaced and period for early retirement.
- Invoices of all completed work. See Appendix A for examples of a good invoice. Invoices for replacements should include:

- The vehicle components and specific engine configuration installed, including the model year or tier level
  - A list of all parts, including engine exhaust controls
- Copies of EPA certificates of conformity for existing and new engine configurations, and confirm the EPA engine family names match the certificates.
- Evidence that the engine of the old vehicle or equipment was rendered permanently disabled or returned to the original engine manufacturer to be remanufactured to the next EPA standard. Documentation should include the engine serial number and vehicle identification number, and may also include photos illustrating how the engine and chassis was disabled. If returned to the engine manufacturer, obtain a letter documenting that the engine is remanufactured to a more stringent EPA standard.
- Documentation of any program income earned, including the sale of original vehicle or equipment parts and record of program income generated by sale thereof. Refer to the Award Terms and Conditions for Program Income requirements.
- Confirm the level of emission reduction achieved by the vehicle replacement matches or exceeds the level described in the grant work plan's project narrative. Emission reduction is based on period associated with early retirement, so include a final comparison with normal fleet turn over and the in-service date for the replacement vehicle or machine.

## **7. Engine Upgrades**

### **a. General Information**

Generally, an engine upgrade involves the removal of parts on a certified engine configuration and replacement with parts that cause the engine to represent an engine configuration which is certified to meet more stringent federal emission standards.

Some engines are able to be upgraded to reduce their emissions by applying manufacturer upgrades that are retrofits verified by EPA or CARB as a package of components demonstrated to achieve specific levels of emission reductions. Some engines are able to be upgraded to a cleaner EPA certified configuration through the application of a “kit” (the “kit” may not necessarily be verified as a retrofit by EPA or CARB, but the “kit” must be used to rebuild the engine to an engine configuration which is certified to meet more stringent federal emission standards. For example, a Tier 0 nonroad engine could be upgraded to a certified Tier 1 nonroad configuration). A kit used to represent a cleaner engine configuration must include full documentation of exactly what components are included to represent the specific certified engine configuration. All emission control components and design specifications must match a certified engine configuration.

### **b. Things to look for in these types of projects**

1. If your project is using the verified Emissions Upgrade Group from Caterpillar, please note that the EPA approval document for the Engine Upgrades states the fuel requirement maximum sulfur content is 500 ppm, however, nonroad applications are required to use fuel no more than 15 ppm sulfur content effective June 2010. Also for projects using the verified Emissions Upgrade Group from Caterpillar, the servicing dealer must follow specific installation instructions approved by Caterpillar and validate that the upgraded engine has the necessary Tier 1 components installed and has been tested to ensure the proper fuel delivery, power, torque and speed. The dealer must submit a validation form to Caterpillar in order to receive a label for the upgraded engine and be in compliance with this verification. Check the EPA Verified Technology List at <http://epa.gov/cleandiesel/verification/verif-list.htm> to ensure the Emissions Upgrade Group from Caterpillar is specified to be used with the specific vehicle or equipment type in your project, and for the applicable model year.
2. *Check pre-and post-emission standard levels for PM and NOx:* Engine upgrades may not be available for all engines, and not all upgrades may achieve an emission benefit, so it is important to check the actual emission standard level of the current and upgraded engines to ensure the upgrade product is reducing emissions. Emission standard levels are based on the engine model year for highway engines, and for nonroad engines the horsepower and model year of the engine are needed to determine the tier level. Check the emissions tables found in the link below to ensure that the proposed upgrade will result in an emissions reduction.

On-Highway Emissions Standards Tables:

<http://www.epa.gov/otaq/standards/heavy-duty/hdci-exhaust.htm>

Nonroad Emissions Standards Tables:

<http://www.epa.gov/otaq/standards/nonroad/nonroadci.htm>

Locomotive Emissions Standards Tables:

<http://www.epa.gov/otaq/standards/nonroad/locomotives.htm>

Marine Emissions Standards Tables:

<http://www.epa.gov/otaq/standards/nonroad/marineci.htm>

3. *Certificates of conformity:* Grantees should obtain relevant copies of certificates of conformity for existing and upgraded engines from the engine manufacturers prior to upgrading the engine. When conducting an upgrade, the entire configuration needs to be included, which must include a complete engine and emission control system to the design specifications of the certified engine configuration. The bid proposal should request a letter from the engine manufacturer confirming that the upgraded engine will meet the design specifications of the certified engine. Note: for verified engine upgrades, the verification letter is used in lieu of the certificate of conformity.
4. *Invoices should be very specific and include all the parts of the certified engine configuration:* Sometimes a critical part of the upgraded certified engine is the catalyst (from an emissions reduction standpoint). Aftercooling may also be critical and the engine manufacturer should affirm the new configuration will meet the applicable cooling requirements. Ensure that the entire configuration is installed according to the invoice. See Grantee File Checklist section, below, for a list of items that should be included on repower invoices.
5. *Note for locomotive and marine upgrades:* Depending on the availability of certified engine rebuild kits, regulations may require that marine engines at or above 600 kW and locomotive engines be upgraded to a lower emission level at the time of rebuild. Consequently, an upgrade project in a marine or locomotive application may overlap with an operator's requirement to install a certified engine upgrade kit at the time of rebuild. In this case, the project could be considered a mandated measure and may not be fundable under the DERA program. It is appropriate to confirm that a marine or locomotive engine upgrade project is not simply going to achieve the same benefit already required with a certified engine upgrade kit. Identify when the original locomotive or marine engine was rebuilt last, when it is due for rebuild next, and if a certified rebuild kit is available. See available guidance on the web at [www.epa.gov/cleandiesel](http://www.epa.gov/cleandiesel) or ask your Project Officer for assistance, if needed.
6. *Selection of vehicles or equipment:* The most cost effective vehicles or equipment will have high annual use (>1000 hours or 50,000 miles).
7. *Operating condition:* To be eligible for upgrade projects, the original engine must be fully operational and performing its intended function to qualify for funding. Vehicles or engines that are not operating in normal service may not be used in upgrade projects.

### **c. EPA Project Officer File Checklist**

In addition to normal grant-management documents, Project Officers should specifically keep the following documentation in their files for projects which incorporate Engine Upgrades:

- Completed Project Fleet Description Spreadsheets: Ensure relevant information is accurately completed, including the year the upgrade takes place, the model year of the engine, etc .
- If the project uses the EPA verified Emissions Upgrade Group from Caterpillar, include a copy of the EPA Verification Letter.
- Document and confirm the original standard level compared to the emission level represented by the engine upgrade.

### **d. Grantee File Checklist**

In addition to normal grant-management documents, grantees should specifically keep the following documentation in their files for projects related to Engine Upgrades:

- Completed Project Fleet Description Spreadsheets: Ensure relevant information is accurately completed using instructions tab. Ask Project Officer for assistance, if needed.
- If the project uses the EPA verified Emissions Upgrade Group from Caterpillar, include copies of the EPA Verification Letter and copies of the validation forms, including documentation that the upgraded engine has the necessary components installed and has been tested to ensure the proper fuel delivery, power, torque and speed. Request a copy of documents from Caterpillar indicating the dealer installed the upgrade accordance with the EPA verification.
- Request for Proposals/Bids for equipment that specify the equipment name, model, make, year, for which engine family and model years, etc.
- Invoices of all completed work. See Appendix A for examples of a good invoice. Invoices for engine upgrades should include:
  - All parts installed, including any exhaust controls
  - Model year and family engine label of the upgraded engine
- Confirm the level of reduction achieved by the upgrade matches the grant work plan's project narrative.
- When requesting bids for upgrades, require documentation of the specific certified engine family and emission level to be achieved, and that the upgrade represented certified engine configuration will include all emission control components and operating characteristics of the certified engine configuration.
- Copies of relevant EPA certificates of conformity for existing and new engine configurations, and confirm the EPA engine family names match the certificates, if applicable. Confirm and document the original engine emission level compared to the emission level represented by the engine upgrade.

## **8. Aerodynamic Technologies & Low Rolling Resistance Tires**

### **a. General Information**

Aerodynamic technologies help minimize drag and smooth out air flow over Class 8 tractor-trailer vehicles. Aerodynamic devices include gap fairings that reduce the gap between the tractor and the trailer to reduce turbulence, trailer side skirts that minimize wind under the trailer, and trailer rear fairings that reduce turbulence and pressure drop at the rear of the trailer. This decrease in drag can help reduce fuel usage for a long haul Class 8 truck.

Low rolling resistance tires decrease the rolling friction between the tires and the road during operation. EPA determined that certain tire models can provide a reduction in NOx emissions and fuel savings when used on all five axles of long haul Class 8 trucks.

The options offered include both dual tires and single wide tires (single wide tires replace the double tire on each end of a drive or trailer axle, in effect turning an "18" wheeler into a "10" wheeler). Low rolling resistance tires can be used with lower-weight aluminum wheels to further improve fuel savings; however, wheels may not be purchased with grant funds.

### **b. Things to look for in these types of projects**

1. *Ensure technology is verified:* In order to be eligible for DERA funding, the aerodynamic devices and low rolling resistance tires must be specifically listed on EPA's Verified Aerodynamic Technologies list or EPA's Verified Low Rolling Resistance Tires list. Check to ensure the specific technology (by name, model, and manufacturer) is on the list AND the technology description provided by the vendor matches what is on the list.

EPA Verified Aerodynamic Technologies List

<http://www.epa.gov/smartway/technology/aerodynamics.htm>

EPA Verified Low Rolling Resistance Tires List

<http://www.epa.gov/smartway/technology/tires.htm>

2. *Request all installation details for Aerodynamic Devices:* Sometimes these devices need to be modified in size and/or shape for specific vehicles. While this may be allowed, be sure to ask the vendor to supply written document on these modifications and show that they are approved by the EPA Verification team.
3. *Restrictions for tires:* Low rolling resistance tires are verified for use on line-haul class 8 trucks. Only verified tires for use and installed on line-haul class 8 trucks (over 33,001 with a sleeper cab) are eligible for funding.
4. *Scrapage Requirements:* For tire replacement projects, the original tires should be scrapped according to local or state requirements, or the tires can be salvaged for reuse or retreading. If salvaged tires are sold, please refer to the award Terms and Conditions for program income requirements.



### **c. EPA Project Officer File Checklist**

In addition to normal grant-management documents, Project Officers should specifically keep the following documentation in their files for projects related to Aerodynamic and/or Low Rolling Resistance Tire technologies:

- Completed Project Fleet Description Spreadsheets: Ensure relevant information is accurately completed.
- Confirm only Class 8 long haul trucks are included in the fleet description.
- Confirm no rims are purchased with DERA funds.
- Confirm only verified tires and/or aerodynamic technologies are used.

### **d. Grantee File Checklist**

In addition to normal grant-management documents, grantees should specifically keep the following documentation in their files for projects related to Aerodynamic and/or Low Rolling Resistance Tire technologies:

- Completed Project Fleet Description Spreadsheets: Ensure relevant information is accurately completed to document the truck is a long-haul Class 8 truck. Ask your Project Officer for assistance, if needed.
- Information documenting that technology is listed on either EPA's Verified Aerodynamic Technologies list or EPA's Verified Low Rolling Resistance Tires list.
- Request for Proposals/Bids for equipment that specify the equipment name, model, make, year, for which engine family and model years, etc.
- Invoices of all completed work. See Appendix A for examples of a good invoice. Invoices for aerodynamic technologies and low rolling resistance tires should include:
  - Specific technology type
  - Technology make
  - Technology model
- Evidence that the old tires were either scrapped according to local or state requirements, or salvaged for reuse or retreading.

## **9. Cleaner Fuels Use**

### **a. General Information**

Cleaner fuels include, but are not limited to, ultra-low sulfur diesel (ULSD) fuel (for nonroad vehicles, engines and equipment prior to EPA or State mandates), biodiesel, diesel emulsions or additives verified by EPA or CARB, compressed natural gas (CNG), propane, and other approved alternative fuels. For new or expanded use of a cleaner fuel, EPA will fund the cost differential between the eligible cleaner fuels and conventional diesel fuels.

### **b. Things to look for in these types of projects**

1. *Compressed Natural Gas and Propane Gas Engines:* In order for CNG or propane engines to be eligible for DERA funding, the engine must be EPA certified (and CARB certified if used in California) with the use of the alternative fuel. Infrastructure costs to support CNG or propane may not be funded.
2. *Cost Differential:* Funding may only be used for the cost differential between the normally required commercially available fuel and the clean fuel.
3. *Fuel Type:* Projects may only use clean fuels verified by EPA or CARB or as required with a certified engine such as with CNG or propane. The alternative fuel must be fully described and approved in the project description.
4. *Marine and Locomotive Engines:* Effective in 2012, marine and locomotive engines will be required to use ULSD. Thus, there will be no more cost-differential funding for these projects.

### **c. EPA Project Officer File Checklist**

In addition to normal grant-management documents, Project Officers should specifically keep the following documentation in their files for projects related to Cleaner Fuels Use:

- Confirm the alternative fuels are acceptable: EPA or CARB verified or, for CNG or propane, required with the engine certification.
- Completed Project Fleet Description Spreadsheets: Confirm vehicles using alternative fuels are specified.
- Confirm that vehicles using CNG or propane are certified to operate on the applicable fuel.
- Confirm vehicles proposed for alternative fuels are covered by the scope of verification with the applicable EPA verification letter or CARB EO.
- Confirm infrastructure costs are not included in the project.
- Confirm new or expanded use (refer to RFP).

### **d. Grantee File Checklist**

In addition to normal grant-management documents, grantees should specifically keep the following documentation in their files, for projects related to the use of cleaner fuels:

- Invoices of all completed work. See Appendix A for examples of a good invoice. Invoices for cleaner fuels use should include:
  - Invoices of all fuel deliveries documenting the fuel type and properties
- If CNG or propane is used, obtain a copy of the EPA certificate of conformity for each applicable engine in the project.
- Copies of all fuel analyses.
- Document quantity of fuel used, the cost of the alternative fuel and cost of the normally required commercially available fuel to determine the eligible funding.
- Records of fueling (quantity of each fuel, vehicle mileage, date, etc.)
- Documentation of any vehicle maintenance or eligible additional costs associated with the use of the alternative fuel. For example, using biodiesel may require additional fuel filter changes and the associated parts and labor should be documented.

# Appendix A Sample Invoices

**1. Example of an exhaust control invoice:** This invoice for a Purifilter DPF includes the model of the technology – Purifilter system – and can therefore be identified as an EPA verified technology listed on EPA’s website. While this can be acceptable, it is appropriate to list the specific technology name and model as described in verification documents. The VIN number of the vehicle is also provided, to ensure that the technology was installed on the intended vehicle. (Identifying information for the contractor and grantee has been intentionally removed).

CUSTOMER #: [REDACTED]  
 UNIT# [REDACTED]  
 ATTN: [REDACTED]  
 HOME: [REDACTED] CONT: [REDACTED]  
 BUS: [REDACTED] CELL: [REDACTED] SERVICE ADVISOR: [REDACTED]

INVOICE  
PAGE 1

UNIT #	YEAR	MAKE/MODEL	VIN	LICENSE	MILEAGE	TAG	
	03	NEW FLYER D40LF	5		239412/239412		
DEL. DATE	PRCD. DATE	WARR. EXP.	PROMISED	PO NO.	RATE	PAYMENT	INV. DATE
19MAY03 DE			17:00 09SEP10			CHG	12NOV10
R.O. OPENED		READY	OPTIONS: ENG: ISC/46294236				
14:14 09SEP10		13:53 12NOV10					
LINE	OPCODE	TECH	TYPE	HOURS	LIST	NET	TOTAL
A INSTALL PURIFILTER SYSTEM							
12-35 INSTALL PURIFILTER SYSTEM ON UNIT							
MILEAGE 239412 HUB 32673							
238 CP							
1 GDTA110557 DPF KIT							
1 GDTA143 DPF INSTALL KIT							
MISC TRAVEL, STAY AND FREIGHT							
CP							
PARTS:	LABOR:		OTHER:	TOTAL LINE A:			
*****							

DESCRIPTION	TOTALS
LABOR AMOUNT	
PARTS AMOUNT	
GAS, OIL, LUBE	
SUBLET AMOUNT	
MISC. CHARGES	
TOTAL CHARGES	
LESS INSURANCE	
SALES TAX	
PLEASE PAY THIS AMOUNT	

This business is required to be licensed by the Secretary of State pursuant to Illinois Revised Statutes, Chapter 95 1/2, Sec. 5-301. Any complaints as to the quality of service be obtained near may be brought to the attention of the Attorney General.

TERMS: Net 30 days for approved customers with credit, all others STRICTLY CASH

I hereby authorize the below repair work to be done along with necessary materials. You and your employees may operate above vehicle for purposes of testing, inspection or delivery at my risk. An express mechanic's lien is acknowledged on above vehicle to secure the amount of repairs thereto. You will not be held responsible for loss or damage to vehicle or articles left in vehicle in case of fire, theft, accident or any other cause beyond your control.

STATEMENT OF DISCLAIMER: The factory warranty constitutes all of the warranties with respect to the sale of this hardware. The Seller hereby expressly disclaims all warranties, either express or implied, including any implied warranty of merchantability or fitness for a particular purpose. Seller neither assumes nor authorizes any other person to assume for it any liability in connection with the sale of this hardware.

CUSTOMER SIGNATURE \_\_\_\_\_

CUSTOMER COPY

2. **Example of an idle reduction technology invoice:** This invoice for a Webasto Scolastic Fuel Operated Heater includes the specific make and model of the technology, and can therefore be identified from EPA's website as a technology that is verified for use on school buses. The vehicle number is also provided to ensure that the technology was installed on the intended vehicle. (Identifying information for the contractor and grantee has been intentionally removed).

ACCOUNT NUMBER: [REDACTED]  
 INVOICE NUMBER: [REDACTED]  
 INVOICE DATE: 10/28/2010  
 INVOICE TERMS: [REDACTED]  
 PURCHASE ORDER#: [REDACTED]  
 VEHICLE#: [REDACTED]

**SERVICE INVOICE**

**BILL-TO**

**SHIP-TO**

Cust. Unit #:	Make:	THOMAS	Model:	SCHOOL BUS	Tag #:	[REDACTED]
V.I.N: [REDACTED]	Model #:		In Serv Date:	12/31/9999	Year:	2009
Engine S/N:	Model #:		In Serv Date:		Mileage:	30,108
Tran S/N:	Model #:		In Serv Date:		Eng Hrs:	0
Recfer S/N:	Model #:		In Serv Date:		Warr ID:	
APU S/N:	APU Gen S/N:		In Serv Date:		Date Create:	10/12/2010
			BOM/Spec:			

Job#1 [REDACTED] General Accessories S-CUST

**INSTALL SCHOOLASTIC WEBASTO HEATER**

SCHOOL BUS VIN#: [REDACTED]

PUT BRACKET ON HEATER. INSTALL ON FRAME. INSTALL FUEL FILTER HEAD. START HOOKING UP EXHAUST. REMOVED FUEL TANK AND ALL BRACKETS AND REMOVED BUNGS FOR FUEL TANK. INSTALLED STAND PIPE. MADE BRACKET FOR FUEL FILTER HOUSING. MOUNTED FUEL FILTER HOUSING. HOOK UP EXHAUST RUN POWER CORD REMOVE SEAT IN FRONT ON INSIDE HEATER. DRILL HOLES IN FLOOR FOR COOLANT PIPES. MAKE PIPES AND INSTALL. RUN STAT WIRES AND INSTALL PROGRAMMER. INSTALL STAND PIPE AND HUNG FUEL TANK. RUN T-STAT WIRING INTO CAB. HAD TO REMOVE T-STAT AND SHIM OUT FOR CLEARANCE. GET HOSES HOOKED UP. INSTALL HOSE FROM HEATER TO ELBOW. PURGE COOLING SYSTEM. TRY TO START UNIT. ONLY COOLANT PUMP RUNS. PRIME FUEL SYSTEM. WILL NOT START. ONLY COOLANT PUMP IS RUNNING. TAKE A BUNCH OF MEASUREMENTS AND FOUND THE INTERNAL STAT IS NOT MAKING CONTACT. OPEN UP HOUSING AND COULD NOT SEE ANYTHING. OPEN UP NEW ONE. REMOVE TOP COVER AND FOUND CONNECTOR UNPLUGGED. OPEN UP UNIT ON BUS AND FOUND SAME CONNECTOR UNPLUGGED. PLUG IN AND UNIT STARTED RIGHT UP. LET RUN. CHECKED FOR COOLANT LEAKS. INSTALL TRIM PANEL, SEAT, FUEL TANK. CHECK FOR LEAKS AND INSTALL WEBASTO COVER. ASSEMBLE NEW UNIT.

Qty	Item	Description	Price Each	Extended
	0THZ2Z	INSTALL SCHOOLASTIC WEBASTO HEATER		
1	5001318A	TIMER 7 DAY DIGITAL WHITE		
1	600050	SET OF 2 ANGLE MTG - WEBASTO		
1	923317	SCHOOLASTIC 12V D EB KIT		
2	FITTING	FITTING		
1	733-5325	u bolt		
6	H-151	1"BLK HOSE		
2	72333	#16 H/CLAMP		
<b>Total</b>		<b>Total</b>		
<b>Labor</b>		<b>Parts</b>	<b>Total</b>	<b>Total</b>

General Accessories

S-CUST

**INSTALL SCHOOLASTIC WEBASTO HEATER**

SCHOOL BUS VIN#: [REDACTED]

3. **Example of a repower invoice:** This invoice for a repower includes the specific engine configuration installed, including the model year or tier level. In addition, it lists all parts involved in the repower to ensure the entire certified engine configuration is being installed in the chassis.

## ACME Manufacturer

1234 Happy Lane  
Ann Arbor, MI 48105

## Sample Customer Invoice

### Sold To

DERA Grantee

INVOICE NUMBER SF040957482	INVOICE DATE 5/17/2011	ORDER NUMBER WP - 4595288	PAGE 1 of 1
MAKE Caterpillar	MODEL 950FII	SERIAL NUMBER 08FL82145	METER READING 15256

### INVOICE DETAILS

Replace Tier 0 750 horsepower engine with Tier 1 750 horsepower engine, including parts and labor necessary to facilitate removal of existing engine and install new Tier I certified engine configuration.

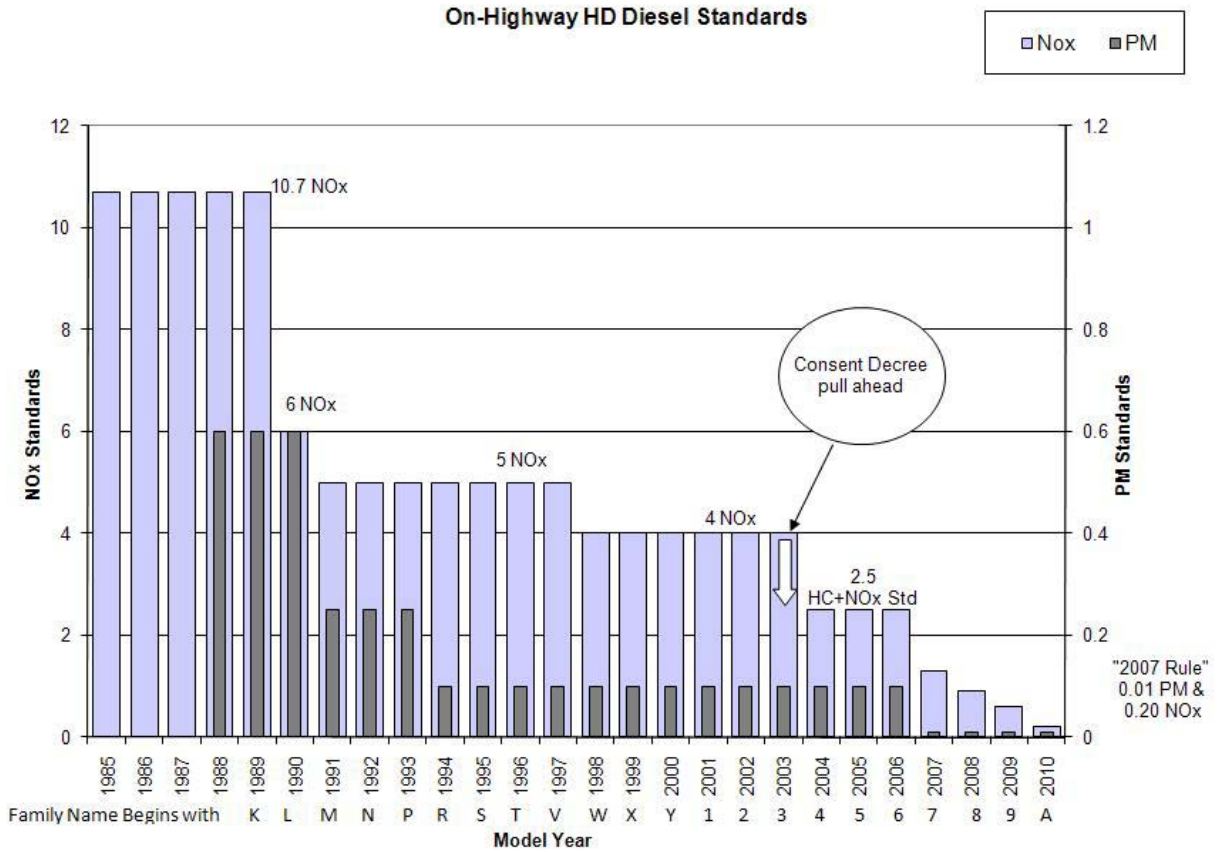
ACTION: BROUGHT MACHINE INSIDE, WASHED ENGINE COMPARTMENT. REMOVED HOOD AND SIDE PANELS. REMOVED EXISTING TIER 0 ENGINE AND REPLACED WITH NEW CERTIFIED TIER 1 ENGINE SYSTEM.

FILLED RADIATOR SYSTEM WITH ALL NEW ELC. CHECKED ENGINE SPECS AND ADJUSTED AS NEEDED. CHECKED FOR ENGINE OIL PRESSURE AND FLUID LEVELS. RAN MACHINE, CHECKED FOR LEAKS AND WASHED OIL FROM MACHINE.

SEGMENT 1	TOTAL LABOR (FLAT-RATE)	3,760.00
	SEGMENT TOTAL	3,760.00
SEGMENT 2		
1.00	0R8760	TIER I Engine
1.00		Core Charge
1.00		Full Core Credit
1.00	1031998	HOSE
1.00	1558899	SEAL-O-RING
2.00	6p00056	RING
1.00	1067850	ELBOW
1.00	6I2408	MUFFLER A
1.00	6I2409	PIPE
1.00	6I2615	SUPPORT
2.00	8X48294	CLAMP
32.00	2889948q	10w30 DEO Quarts
	SEGMENT TOTAL (FLAT-RATE)	13,622.71
	<b>SUBTOTAL</b>	<b>17,382.71</b>
	<b>PAY THIS AMOUNT</b>	<b>17,382.71</b>

## Appendix B – On-highway Engine Emission Standards

**Note:** See the Code of Federal Regulations (CFR) for the official standards or reference <http://www.epa.gov/otaq/standards/heavy-duty/hdci-exhaust.htm>



## Appendix C - Nonroad Engine Standards Quick Reference (see CFR for official stds.)

Standard	Rated Power (hp)	Rated Power (kW)	Tier	Model Year	NMHC (g/kW-hr)	NMHC + NOx (g/kW-hr)	NOx (g/kW-hr)	PM (g/kW-hr)	CO (g/kW-hr)	Smoke <sup>a</sup> (Percentage)	Useful Life (hours/years) <sup>b</sup>	Warranty Period (hours/years) <sup>b</sup>
Federal	hp < 10.7	kW < 8	1	2000-2004	-	10.5	-	1	8	20 / 15 / 50	3,000 / 5	1,500 / 2
			2	2005-2007	-	7.5	-	0.8	8			
			4	2008+	-	7.5	-	0.40 <sup>f</sup>	8			
	10.7 ≤ hp < 25.5	8 ≤ kW < 19	1	2000-2004	-	9.5	-	0.8	6.6		3,000 / 5	1,500 / 2
			2	2005-2007	-	7.5	-	0.8	6.6			
			4	2008+	-	7.5	-	0.4	6.6			
	25.5 ≤ hp < 49.6	19 ≤ kW < 37	1	1999-2003	-	9.5	-	0.8	5.5		5,000 / 7 <sup>d</sup>	3,000 / 5 <sup>e</sup>
			2	2004-2007	-	7.5	-	0.6	5.5			
			4	2008-2012	-	7.5	-	0.3	5.5			
				2013+	-	4.7	-	0.03	5.5			
	49.6 ≤ hp < 75.1	37 ≤ kW < 56	1	1998-2003	-	-	9.2	-	-			
			2	2004-2007	-	7.5	-	0.4	5			
			3 <sup>g</sup>	2008-2011	-	4.7	-	0.4	5			
			4 (Option 1) <sup>h</sup>	2008-2012	-	4.7	-	0.3	5			
			4 (Option 2) <sup>h</sup>	2012	-	4.7	-	0.03	5			
				2013+	-	4.7	-	0.03	5			
	75.1 ≤ hp < 100.6	56 ≤ kW < 75	1	1998-2003	-	-	9.2	-	-			
			2	2004-2007	-	7.5	-	0.4	5			
			3	2008-2011	-	4.7	-	0.4	5			
			4	2012-2013 <sup>h</sup>	-	4.7	-	0.02	5			
	2014+ <sup>i</sup>	0.19		-	0.4	0.02	5					
	100.6 ≤ hp < 174.3	75 ≤ kW < 130	1	1997-2002	-	-	9.2	-	-			
			2	2003-2006	-	6.6	-	0.3	5			
			3	2007-2011	-	4	-	0.3	5			
			4	2012-2013 <sup>h</sup>	-	4	-	0.02	5			
	2014+ <sup>i</sup>	0.19		-	0.4	0.02	5					
	174.3 ≤ hp < 301.7	130 ≤ kW < 225	1	1996-2002	1.3 <sup>j</sup>	-	9.2	0.54	11.4		8,000 / 10	3,000 / 5
			2	2003-2005	-	6.6	-	0.2	3.5			
3			2006-2010	-	4	-	0.2	3.5				
4			2011-2013 <sup>h</sup>	-	4	-	0.02	3.5				
	2014+ <sup>i</sup>	0.19	-	0.4	0.02	3.5						
301.7 ≤ hp < 603.4	225 ≤ kW < 450	1	1996-2000	1.3 <sup>j</sup>	-	9.2	0.54	11.4				
		2	2001-2005	-	6.4	-	0.2	3.5				
		3	2006-2010	-	4	-	0.2	3.5				
		4	2011-2013 <sup>h</sup>	-	4	-	0.02	3.5				
2014+ <sup>i</sup>	0.19		-	0.4	0.02	3.5						
603.4 ≤ hp < 751	450 ≤ kW < 560	1	1996-2001	1.3 <sup>j</sup>	-	9.2	0.54	11.4				
		2	2002-2005	-	6.4	-	0.2	3.5				
		3	2006-2010	-	4	-	0.2	3.5				
		4	2011-2013 <sup>h</sup>	-	4	-	0.02	3.5				
2014+ <sup>i</sup>	0.19		-	0.4	0.02	3.5						
751 ≤ hp < 1207	560 ≤ kW < 900	1	2000-2005	1.3 <sup>j</sup>	-	9.2	0.54	11.4				
		2	2006-2010	-	6.4	-	0.2	3.5				
		4	2011-2014	0.4	-	3.5	0.1	3.5				
			2015+ <sup>i</sup>	0.19	-	3.5 <sup>k</sup>	0.04 <sup>l</sup>	3.5				
hp > 1207	kW > 900	1	2000-2005	1.3 <sup>j</sup>	-	9.2	0.54	11.4				
		2	2006-2010	-	6.4	-	0.2	3.5				
		4	2011-2014	0.4	-	3.5 <sup>k</sup>	0.1	3.5				
			2015+ <sup>i</sup>	0.19	-	3.5 <sup>k</sup>	0.04 <sup>l</sup>	3.5				



## Appendix D – Example EPA Certificate of Conformity

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, DC 20460

2000 Model Year Certificate of Conformity

Manufacturer: Cummins Engine Company, Inc.  
Certificate Number: CEX-URB-00-27  
Effective Date: 12/20/99  
Date Issued: 12/20/99



Gregory A. Green, Director, VPCD  
Office Of Mobile Sources

Pursuant to Section 206 of the Clean Air Act (42 U.S.C. section 7525), 40 CFR Part 86, and the Consent Decree (Civil Action No. 98-02546) entered and approved by the U.S. District Court for the District of Columbia on July 1, 1999, this certificate of conformity is hereby issued with respect to the test engines which represent the following motor vehicle engines, by engine family, and is subject to the terms and conditions prescribed in those provisions and the Consent Decree.

**Heavy Duty (Urban Bus) Diesel Engine Family: YCEXH0505CAF (413M)**

This certificate of conformity covers only those new motor vehicle engines which conform, in all material respects, to the design specifications that applied to those engines described in the documentation required by 40 CFR Part 86 and the Consent Decree.

This certificate of conformity covers those new motor vehicle engines produced by Cummins Engine Company during that production period of the model year stated on this certificate (model year as defined in 40 CFR Part 86).

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 86.096-7, 86.606, and 86.1006 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Part 86 including 40 CFR 86.095-30, or render the certificate void ab initio as specified in 86.096-7. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void ab initio for other reasons specified in 40 CFR Part 86, including 40 CFR 86.095-30, 86.612, 86.096-7, and 86.1012.

This certificate does not cover vehicles or engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate. This certificate does not cover vehicles or engines imported prior to the effective date of the certificate.

## Appendix E – Example Engine Emission Control Labels

*Note:* The label may be hard to see or read. These are actual pictures from engines and illustrate how you should be able to find the EPA engine family name on the label.



Engine Family Name



Engine Family Name

## Appendix F – Example Vehicle Inspection Sheet

### Diesel Retrofit Project Pre-Installation Checklist

The following list outlines the key technical aspects of a diesel retrofit project that should be checked prior to installation of a verified emission control device on a vehicle.

- \_\_\_ Engine characteristics must meet all terms and conditions of retrofit device verification letter (model year, engine family, engine configuration)
- \_\_\_ Intake air filter condition
- \_\_\_ Absence of air intake system leaks (including charge air cooler)
- \_\_\_ Exhaust peak opacity (over the SAE J1667 protocol): \_\_\_\_\_
  - Certain Mack engines: <30% limit
  - All other engines: <20% limit

(Note: There should be no signs of blue smoke or white smoke; most MY 1994 and newer engines were certified with OE peak opacities <10%. It is the right of the technology provider and its distributors to reject a vehicle even if the opacity value is below the limit if, in their opinion, the vehicle presents an atypical opacity value.)
- \_\_\_ Exhaust system integrity
- \_\_\_ Absence of visual signs of engine oil or diesel fuel present in exhaust system
- \_\_\_ Absence of turbocharger seal leaks
- \_\_\_ Absence of audible combustion problems
- \_\_\_ Absence of excessive crankcase vent tube emissions. Flow if measured: \_\_\_\_\_
- \_\_\_ Engine mileage accumulation: \_\_\_\_\_

If the engine mileage accumulation exceeds the following values, the technology provider advises the owner that the higher rate of occurrence of spontaneous engine component failures may result in unwarranted failure of the emission control device:

  - Class 8 (>33,000 lbs.): >600,000 miles
  - Class 6 & 7 (19,501-33,000 lbs.): >200,000 miles
  - Class 4 & 5 (14,001-19,500 lbs.): >150,000 miles
- \_\_\_ Diesel fuel used must comply with terms and conditions of retrofit device verification letter (sulfur level, biodiesel specification, fuel additives)
- \_\_\_ Application duty-cycle must comply with terms and conditions of retrofit device verification letter
- \_\_\_ Documented data logging results and analysis provided to the owner - if exhaust temperature criteria are applicable.
- \_\_\_ Conduct safety analysis of retrofit device installation (visibility, location of device relative to fuel lines, structural framework, heat issues)

**Appendix G – Example Certification of Installation**

**Equipment Installation Firm:** \_\_\_\_\_

Contact Name and Telephone Number: \_\_\_\_\_

**Fleet / Vehicle Owner:** \_\_\_\_\_

Contact Name and Telephone Number: \_\_\_\_\_

**Vehicle Information:**

Vehicle Manufacturer: \_\_\_\_\_

Vehicle VIN Number: \_\_\_\_\_

Vehicle ID Number: \_\_\_\_\_

Vehicle Make, Model & Year \_\_\_\_\_

**Emission Reduction Equipment Information:**

Equipment Type: \_\_\_\_\_

Equipment Manufacturer: \_\_\_\_\_

Equipment Model: \_\_\_\_\_

<b>Equipment Type:</b>		
DOC: Diesel Oxidation Catalyst	CCV: Closed Crankcase Ventilation	DPF: Diesel Particulate Filter
FOH: Fuel Operated Heater	APU: Auxiliary Power Unit	BAC: Battery Air Conditioner

**We certify that we have installed the above-referenced emissions reduction equipment in accordance with the manufacturer’s specifications and warranty requirements. We certify that the equipment installed is a “Verified Technology” by the USEPA or California Air Resources Board for the subject vehicle. We further certify that we have assessed the operation of such equipment, to the extent possible, and it is functioning as intended:**

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Work Order Number

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Invoice Number

\_\_\_\_\_  
Date