

Final Report

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|--------------------------|---|
| Grant Program: | Northeast Diesel Collaborative Emissions Reduction Program |
| Project Title: | Northeast Diesel Collaborative Maintenance Vehicle Project |
| Grant Recipient: | Connecticut Department of Environmental Protection |
| Grant Number: | #DE-97199001 |
| EPA Award Amount: | \$50,000 |
| Date Submitted: | April, 2011 |

| Table 1. Expenditures (Record all funds expended for each budget category.) | | | |
|---|-------------------------------------|----------------------------------|--|
| | Total Federal Funds Expended | Total Cost-Share Expended | Total Additional Leveraged Funds Expended |
| Personnel | | | |
| Fringe Benefits | | | |
| Travel | | | |
| Equipment | | | |
| Supplies | | | |
| Contractual | \$49,867.00 | | |
| Other | | | |
| Indirect Charges | | | |
| TOTALS | \$49,867.00 | | |

| Table 2. Actual Results | | | | | |
|--|--|--------------|-------------|------------|------------|
| | NOx | PM | HC | CO | CO2 |
| Annual Reductions (tons) | 0 | 0.0263 | 0.1242 | 0.4168 | 0 |
| Lifetime Reduction (tons) | 0 | 0.3449 | 1.6450 | 5.5467 | 0 |
| Capital Cost Effectiveness (\$/ton) | NA | \$144,599.80 | \$30,314.32 | \$8,990.44 | NA |
| Total Project Cost Effectiveness (\$/ton) | NA | \$144,599.80 | \$30,314.32 | \$8,990.44 | NA |
| Gallons of Diesel Fuel Saved | Annual = NA Lifetime = NA | | | | |
| Health Benefits | \$46,000 per year | | | | |

Provide a narrative description of the project.

The Connecticut Department of Environmental Protection (CTDEP) was granted funding to install emission control technologies on its own agency diesel equipment used in state parks and on air compressors in the Connecticut Department of Transportation (ConnDOT) construction fleet to be used on highway projects statewide. With EPA's approval, the program was revised to replace the air compressor project with a project to retrofit ConnDOT maintenance trucks with DOCs.

CTDEP Trucks and Equipment Retrofits: CTDEP selected a Vendor from a list previously compiled by the Connecticut Department of Administrative Services (CTDAS) after a competitive process, for the Connecticut Clean School Bus Program. That program was funded by a legislative allocation and by the 2008 State Diesel Emissions Reduction Act (DERA) grant #DS97195401. Then, with input from CTDEP's equipment maintenance staff and the Vendor, CTDEP refined the list of vehicles originally proposed for retrofit. A workshop was held for the CTDEP's Support Services equipment maintenance staff. In the same quarter, the Vendor had the opportunity to inspect the vehicles and pieces of equipment identified for possible retrofit. Through these inspections, the number of retrofits was reduced from twenty to fifteen. Five of the trucks were found to have emission controls in place and one had been retired, but an additional, eligible truck was located and was added to the list. When emission controls were installed on the two pieces of construction equipment it was discovered that there were sight-line issues that could not be resolved. This left a total of 13 trucks to be successfully retrofitted.

The project had originally been scheduled to end on August 31, 2009. A revision request was prepared to extend the project period to January 31, 2011 to allow for completion of this project and the ConnDOT retrofits. The revision request was submitted to EPA on July 10, 2009 and the Assistance Amendment was approved September 28, 2009. The CTDEP Fleet Retrofit Project was completed October 7, 2009. Of the \$40,000.00 allocated for the CTDEP retrofits, \$19,097.00 was spent.

ConnDOT Retrofits: In the months between drafting of the application and the award of this grant, the California Air Resources Board (CARB) developed a separate verification program for stationary diesel engines that was independent of the existing off-road verification. The CARB-verified technology options for use in retrofitting air compressors are few and costly. At that time, the price for purchase of a single, verified DPF for use on an air compressor exceeded the \$10,000.00 allocation to retrofit ConnDOT's air compressors. There were no DOCs verified for use in this application. Options for revising this portion of the project were developed and ConnDOT decided that using the funds to retrofit some of its maintenance trucks with DOCs would be the most cost-effective alternative. A request to effect this change and to make the appropriate budgetary adjustments was included in the July 10, 2009 revision request and approved, as mentioned above.

Upon approval of the revision, procedures were developed and put in place to allow CTDEP to move funds to pay for the retrofits of Conn DOT snow-plowing dump trucks. DOCs were ordered for Conn DOT trucks, but due to the seasonal usage of these vehicles, no installations were completed until the fifth quarter, when 16 snowplowing trucks were retrofitted.

After completion of the 13 CTDEP truck retrofits, \$20,903.00 remained in the CTDEP retrofit account with no remaining CTDEP vehicles/equipment eligible for retrofits. On April 23, 2010, a revision request was submitted to allow funds to be reallocated from the CTDEP Vehicle Retrofit to the ConnDOT Retrofit Project for verified DOC retrofits of additional ConnDOT-owned vehicles and equipment. EPA approved the request on May 24, 2010. The total allocated for ConnDOT retrofits then became \$30,903.00.

While awaiting approval of the revision request, ConnDOT and CTDEP identified trucks and equipment for which verified DOCs would be available. It was decided to use the remaining funds to retrofit the last eight 2000-2002 model year (MY) snowplowing dump trucks in the ConnDOT fleet with verified DOCs from BASF, and to retrofit two 1999 MY dump trucks with verified DOC/closed crankcase ventilation systems (CCVs) from Engine Control Systems (ECS). That brought the total number of ConnDOT retrofits to 26. The eight 2000-2002 MY trucks were retrofitted in the seventh quarter. The two remaining retrofits were completed December 8, 2010, ahead of the January 31, 2011 end date for the project period.

Provide a narrative discussion of the actual project results (outputs and outcomes) and how the results are quantified. These may include, but are not limited to:

- Number of replaced or retrofitted engines/vehicles/equipment and/or hours of idling reduced;
- Emission Reductions, Cost Effectiveness and Diesel Fuel Saved, as shown in Table 2 above;
- Health benefits achieved (health benefits may be measured by numbers of illnesses (e.g. reductions in the number of children with asthma, health care costs, or missed work/school days avoided);
- Adoption of an idle-reduction policy or changes in driver behavior regarding idling practices
- Documented improved ambient air quality;
- Sub-recipient information (name, award amount, project description);
- Vendor information (name, payment amount, good/services provided);
- An increased understanding of the environmental or economic effectiveness of the implemented technology;
- Dissemination of the project information and increased knowledge via list serves, websites, journals, and press/outreach events (provide web links where applicable);
- Widespread adoption of the implemented technology;
- Increased public awareness of project and results
- Other

- **Number of replaced or retrofitted engines/vehicles/equipment:** Thirty-nine vehicles were retrofitted with diesel oxidation catalysts (DOCs), two of which also received CCVs.
- **Emission Reductions, Cost Effectiveness and Diesel Fuel Saved, as shown in Table 2 above:** The environmental benefits resulting from installation of DOCs on the 39 trucks were calculated using EPA's diesel emissions quantifier (DEQ). Those lifetime emission reductions are compiled into Table 3 below. Note that the DOCs chosen for each project were from different manufacturers and have different verified percent reductions. Those technologies were selected not only for their effectiveness in reducing emissions, but also with consideration for the intended application, product availability and price.

Table 3: Potential Lifetime Emission Reductions from the CTDEP Maintenance Vehicle & ConnDOT Truck Retrofit Projects

| DOCs: 24 ConnDOT Trucks | | | | | |
|-------------------------------|----------------------|-----------|----------|----------|----------------------|
| Lifetime | NO _x tons | PM tons | HC tons | CO tons | CO ₂ tons |
| Baseline of Fleet | 46.31 | 0.89 | 2.61 | 8.15 | 6,188.39 |
| Percent Reduced (%) | 0 | 20 | 50 | 40 | 0 |
| Amount Reduced | 0 | 0.18 | 1.30 | 3.26 | 0 |
| Cost per Ton Reduced | NA | \$150,048 | \$20,518 | \$8,212 | NA |
| DOCs & CCVs: 2 ConnDOT Trucks | | | | | |
| Lifetime | NO _x tons | PM tons | HC tons | CO tons | CO ₂ tons |
| Baseline of Fleet | 5.50 | 0.08 | 0.20 | 0.65 | 402.88 |
| Percent Reduced (%) | 0 | 40 | 75 | 60 | 0 |
| Amount Reduced | 0 | 0.03 | 0.15 | 0.39 | 0 |
| Cost per Ton Reduced | NA | \$124,955 | \$26,505 | \$10,320 | NA |
| DOCs: 13 CTDEP Trucks | | | | | |
| Lifetime | NO _x tons | PM tons | HC tons | CO tons | CO ₂ tons |
| Baseline of Fleet | 15.82 | 0.32 | 0.69 | 2.47 | 1,769.03 |
| Percent Reduced (%) | 0 | 40 | 70 | 40 | 0 |
| Amount Reduced | 0 | 0.13 | 0.48 | 0.99 | 0 |
| Cost per Ton Reduced | NA | \$148,301 | \$39,736 | \$19,335 | NA |

- **Health benefits achieved (health benefits may be measured by numbers of illnesses (e.g. reductions in the number of children with asthma), health care costs, or missed work/school days avoided):** The DEQ projects the annual health benefits for the ConnDOT retrofits to be \$23,000.00, for the DOC/CCV retrofits \$4,500.00 and for the CTDEP retrofits to be \$18,000.00. The total health benefits from the project were projected to be \$46,000.00 per year.
- **Documented improved ambient air quality:** All of the retrofitted vehicles were deployed statewide; any incremental improvement in air quality resulting from the emission controls would be extremely difficult to detect.
- **Sub-recipient information (name, award amount, project description):**
Connecticut Department of Transportation received \$30,770 to retrofit 26 maintenance trucks.
- **Vendor information (name, payment amount, good/services provided):**
 - Cummins Power Systems was paid \$26,760 for purchase and installation of 24 BASF DOCs on ConnDOT maintenance trucks.
 - Mondial Automotive was paid \$19,097 for purchase and installation of 13 ECS DOCs on CTDEP maintenance trucks and \$4,010 for purchase and installation of ECS DOC/CCV combinations on two ConnDOT maintenance trucks.

- **An increased understanding of the environmental or economic effectiveness of the implemented technology:**
At the beginning of the project period, CTDEP and its Vendor conducted a workshop for its equipment maintenance staff to introduce them to the technology and its benefits.

- **Dissemination of the project information and increased knowledge via list serves, websites, journals, and press/outreach events (provide web links where applicable):**
 - On February 18, 2009, at the beginning of the project, CTDEP's Bureau of Air Management organized a workshop for Support Services staff in charge of maintaining the CTDEP fleet. The selected Vendor brought some of its own mechanics to explain the technology and the installation process and to address any concerns the CTDEP Support Services staff may have had. The meeting was highly successful, with nearly all of CTDEP's vehicle maintenance staff in attendance. The maintenance staff's increased understanding of the technology was critical to the successful completion of subsequent phases of the project.
 - The May 24, 2010 Assistance Amendment to the Cooperative Agreement between CTDEP and EPA for grant #DE-97199001-2, was posted on the CTDEP website, under "2008 EPA/DERA Diesel Emission Reduction Projects," along with the original agreement and preceding amendments, at http://www.ct.gov/dep/cwp/view.asp?a=2684&q=322102&depNav_GID=1619
 - The completion of the CTDEP fleet retrofit project was announced in an article in the December 2009 edition of **The Bureau Update**, a monthly newsletter for CTDEP's Bureau of Air Management.
 - On November 8, 2010, CTDEP sent a message to all of its clean diesel stakeholders announcing the publication of the RFP for the 2011 National Clean Diesel Funding Assistance Program competition. Stakeholders were encouraged to participate in EPA's webinar on the National Competition for Regions 1-4 that took place on November 9, 2010. The registration link for the webinar was included.

- **Widespread adoption of the implemented technology:** Both agencies report satisfaction with the mufflers and their performance. ConnDOT was sufficiently impressed with the technology that it applied for and was awarded a grant from CTDEP's State ARRA/DERA grant to install DOCs on its entire fleet of maintenance/snowplowing trucks, an additional 149 vehicles, as well as on a number of pieces of construction equipment working on highway projects.

- **Increased public awareness of project and results:** Because this project was done concurrently with a separate, ARRA/DERA-funded project to retrofit the ConnDOT maintenance trucks used in snowplowing, the concept generated more publicity than would normally be expected for a project of this limited scale. When the entire fleet of ConnDOT maintenance trucks had been retrofitted, the Governor issued a press release that applied equally to both programs. The link below is to one of the articles resulting from that press release.
<http://www.middletownpress.com/articles/2010/01/06/news/doc4b43fcda0a488108920654.txt?viewmode=fullstory>

- Other: Not Applicable

Provide a summary of the proposed outputs and outcomes as listed in the approved project Work Plan. Provide a comparison of actual results with the proposed outputs/outcomes specified in the approved project Work Plan. Explain the reason for any differences in proposed versus actual outputs/outcomes.

Outputs: This project resulted in 39 on-road vehicles being retrofitted with diesel oxidation catalysts (DOCs) as compared to the proposed totals of 13 on-road and up to 11 off road retrofits. Approximately 0.34 tons of PM will be reduced with an overall cost-effectiveness of \$144,600/ton, which was significantly better than projected in the proposal (0.24 tons at \$2,062,730/ton). CTDEP and ConnDOT worked with the vendors and fleet maintenance personnel to monitor the installation process of all the vehicles and equipment being retrofitted under this grant. The small number of vehicles found to be eligible for retrofitting in the CTDEP fleet did not provide a significant opportunity to institute an improved operational tracking system for the CTDEP fleet, but the maintenance staff did follow the performance of the retrofitted vehicles with interest and continue to be supportive of the project's benefits.

Outcomes:

- **Short term outcomes:** Even though the small number of eligible vehicles did not allow for overall improvements in operational tracking, by observing the performance of the retrofitted vehicles in its own fleet, CTDEP did increase its knowledge of the effectiveness of these technologies. Despite its successful conclusion and internal reports on the CTDEP retrofits, this small grant was totally superseded by the American Recovery and Reinvestment Act (ARRA)/ DERA Grant that was awarded in 2009 and the publicity associated with it. Therefore, there was limited opportunity to feature this program as part of CTDEP's education and outreach efforts for diesel emissions reduction. However, the CTDEP webpages dealing with diesel emissions reduction projects are currently being revised and will include a description of this successful program.
- **Medium-term outcomes:** CTDEP obtained documented evidence of the actual costs and benefits of this technology. CTDEP used this documentation in encouraging ConnDOT to expand the retrofits in its fleet and in including retrofits for municipalities in its work plans for State DERA funding.
- **Long-term outcomes:** As with Connecticut's One Thing™ campaign, promoting the cumulative benefits of many small efforts, implementing an increasing number of small retrofit projects can add up to improving Connecticut's air quality and the health of its residents, decreasing incidents of asthma and other conditions related to diesel pollution. Connecticut has not reached a point where long term benefits can be fully assessed, but all the retrofitted vehicles are still in service and continue to provide reduced emissions that will contribute to the predicted outcomes.

Provide a narrative discussion of the successes and lessons learned for the entire project.

The first success of this project was confirmation using a relatively small grant to retrofit a larger number of vehicles with diesel oxidation catalysts (DOCs) would be a more cost-effective emission reduction strategy than retrofitting a few vehicles with more effective but more expensive diesel particulate filters (DPFs). Along the way, CTDEP learned that DOCs have a significant range of potential PM reductions, from 20 to 40%. By selecting the most effective DOC technology available from the vendors on the state contract, CTDEP was able to enhance the projected result. Table 4 represents a comparison of the emission reduction benefits from the 39 DOC retrofits to the seven DPF retrofits that we would have been able to cover with the same \$50,000 using vendors under state contract. The results confirm the hypothesis behind this grant.

**Table 4: Potential Lifetime Emission Reductions from \$50K Grant:
Comparing 39 DOCs to 7 DPFs**

| Actual DOCs: 39 Trucks Health Benefits \$46,000 | | | | | |
|--|----------------------------|----------------|----------------|----------------|----------------------------|
| Lifetime | NO_x tons | PM tons | HC tons | CO tons | CO₂ tons |
| Baseline of Fleet | 68.1591 | 1.3080 | 3.4967 | 11.2634 | 8,430.3914 |
| Percent Reduced (%) | 0 | 26.7 | 47.4 | 49.3 | 0 |
| Amount Reduced | 0 | 0.3449 | 1.6450 | 5.5467 | 0 |
| Cost per Ton Reduced | NA | \$144,600 | \$30,314 | \$8,990 | NA |
| Hypothetical DPFs: 7 Trucks Health Benefits \$29,000 | | | | | |
| Lifetime | NO_x tons | PM tons | HC tons | CO tons | CO₂ tons |
| Baseline of Fleet | 13.3171 | 0.2556 | 0.7505 | 2.3651 | 1,773.9283 |
| Percent Reduced (%) | 0 | 85 | 90 | 90 | 0 |
| Amount Reduced | 0 | 0.2173 | 0.6755 | 2.1286 | 0 |
| Cost per Ton Reduced | NA | \$230,127 | \$74,020 | \$23,490 | NA |

The education of the CTDEP and ConnDOT maintenance staff about the effectiveness and ease of installation of the DOCs was a noteworthy benefit of the project. At the inception of the project, CTDEP held a workshop for its equipment maintenance staff, at which they could ask questions of the technology vendor and resolve concerns and misconceptions associated with diesel emission control technology. ConnDOT was sufficiently impressed with the technology that it applied for some of the state's ARRA/DERA funds to retrofit the remaining dump trucks in the fleet used for maintenance and snowplowing. Furthermore, the Transportation Equipment Repair Manager for ConnDOT continues to seek out new emission reduction technologies for his equipment and is currently tracking the verification process for automatic on/off switches for ConnDOT construction equipment.

Due to sightline issues and changes to verification programs, CTDEP and ConnDOT were unable to gain experience with emission controls on off-road equipment through this grant. CTDEP had very few pieces of construction equipment for which verified emission control technology was available and both of the units selected were subject to sightline issues and could not be retrofitted. ConnDOT had originally proposed to retrofit several of the diesel-powered air compressors that it uses at construction sites. As was mentioned previously, however, a change in CARB's verification program for stationary diesel engines made it impossible to accomplish such retrofits within the allocated budget.

The ConnDOT air compressor proposal, discussed above, illustrates another lesson learned during this program: the importance of monitoring changes in the EPA and CARB lists of verified technologies. Because the change was caught early, CTDEP was able to obtain approval for a project revision in time to move forward with the alternate ConnDOT project and complete that project in a timely manner. As verified technologies improve, become more widely available and less expensive, more options will continue to emerge for successful integration into existing and proposed grant-funded programs. This lesson is being continually applied as CTDEP seeks out projects for funding under its state DERA allocation.

An additional lesson learned early in the program was the importance of structuring a project timeline to maximize the use of resources shared by more than one grant-funded project. The Work Plan schedule for the CTDEP portion of the program was established in consideration of the fact that the first quarter of this project overlapped the second and third quarters of the Connecticut Clean School Bus Supplemental Funding Program, funded by the 2008 State Diesel Emissions Reduction Act (DERA) grant #DS97195401-3. Both projects involved the same Vendors under contracts established by the CTDAS following a competitive procurement process in 2007. The more pressing deadlines associated with the school bus project dictated that the resources for installing diesel emission controls be directed toward the school bus program during the first quarter. The project timeline, therefore, included events in the first quarter that were important, but that did not interfere with the school bus retrofits. The most significant of these included the informational workshop for the CTDEP equipment maintenance staff, the identification of vehicles that could be retrofitted and initial discussions with ConnDOT regarding alternatives to the air compressor retrofits.

Finally, the challenges presented by the change in verification status of technologies to retrofit the ConnDOT air compressors provided CTDEP the opportunity to work closely with EPA to develop alternatives that would be consistent with the original proposal and would maximize the benefits of the program. With EPA's guidance and approval, CTDEP was able to retrofit ConnDOT maintenance trucks instead of air compressors, extend the project period to allow completion of the substitute project and reallocate funds that could not otherwise be spent, to accomplish the greatest number of retrofits. This constructive interaction has been put to continued good use in CTDEP's administration of its State DERA and ARRA/DERA Grants.

If any cost-share or additional leveraged funds are reported in Table 1 above, identify the source of the funds.

Not Applicable

Was any program income generated during the project period? Identify amount of program income, how it was generated, and how the program income was used.

Not Applicable

For projects involving vehicle/equipment replacement and repowers provide:

- 1) Evidence that the replacement activity is an “early replacement,” and would not have occurred during the project period through normal attrition (i.e. without the financial assistance provided by EPA). Supporting evidence can include verification that the vehicles or equipment replaced had useful life left and fleet characterization showing fleet age ranges and average turnover rates per the vehicle or fleet owner’s budget plan, operating plan, standard procedures, or retirement schedule; and**
- 2) Evidence of appropriate scrappage or remanufacture, including the engine serial number and/or the vehicle identification number (VIN).**

Not Applicable

*Include Attachments as Necessary

For projects that take place in an area affected by, or that include affected vehicles, engines or equipment affected by, Federal, State or local law mandating emissions reductions, provide evidence that emission reductions funded with EPA funds were implemented prior to the effective date of the mandate and/or are in excess of (above and beyond) those required by the applicable mandate.

Not Applicable

*Include Attachments as Necessary

Additional Information

U. S. Environmental Protection Agency
Project Fleet Description Spreadsheet



NEDC Emissions Reduction Program: CTDEP Maintenance Vehicle and ConnDOT Truck Retrofit Project
#DE-97199001-2

Recipient Information

| Organization/Grantee Name | First Name | Last Name | JobTitle | Address | City | State | EmailAddress | ZipCode | OfficePhone | OfficePhoneExt |
|---------------------------|------------|-----------|----------|---------------|----------|-------|-----------------------|------------|--------------|----------------|
| CT DEP | Tracy | Babbidge | Director | 79 Elm Street | Hartford | CT | tracy.babbidge@ct.gov | 06106-5127 | 860-424-3027 | |

Project 1 Information

| Project Name | Organization Performing Project | Target Fleet | Number of Vehicles | City | County | State | Region | Funding Amount | Additional Funding Source | Additional Funding Amount | Public Benefit |
|-----------------------------------|---------------------------------|--------------|--------------------|------|--------|-------|--------|----------------|---------------------------|---------------------------|----------------|
| CT DEP Maintenance Fleet Retrofit | CT DEP | Other | 13 | | | CT | | \$19,097 | | | yes |

Fleet 1 Information:

| Current Vehicle Information | | | | | | | | | | | | New Vehicle/Technology Information | | | | | | | | | | | | | |
|-----------------------------|-------------|-----------------|---------------|---------------|-------------------|-------------------|---------------------------|-----------------------------------|---|-----------|--|--|---|----------------------------------|---|-------------------------|---------------------------|-----------------|---------------------------|--|---|---|--|----------------------|-----------------------------------|
| Vehicle Type | TargetFleet | Class/Equipment | Vehicle Count | Engine Make | Engine Model | Engine Model Year | Horsepower (Nonroad Only) | Current Tier Level (Nonroad Only) | Current Standard Level for PM and NOx or NMHC+NOx | Fuel Type | Amount of Fuel Used (gal/year for all engines in this row) | Annual Miles per vehicle (On Highway Only) | Annual Usage Rate Hours per engine (Nonroad Only) | Annual Idling Hours (per engine) | Serial and/or VIN # of scrapped engine and/or vehicle | Year of Retrofit Action | Technology Type | Technology Make | Verified Technology Model | New Engine Model Year (for replacements/repowers Only) | New Tier Level (Nonroad replacements/repowers Only) | New Standard Level for PM and NOx or NMHC+NOx | Annual Idling Hours Reduced (per engine) | Technology Unit Cost | Technology Unit Installation Cost |
| On Highway | Other | Class 8A | 1 | Caterpillar | 3306 | 1994 | NA | NA | NA | ULSD | 1460 | 10157 | NA | NA | NA | 2009 | Diesel Oxidation Catalyst | ECS | AZ Purmuffler | NA | NA | NA | NA | \$1,469.00 | included |
| On Highway | Other | Class 8A | 1 | Mercedes-Benz | OM 460 LA CID 781 | 2003 | NA | NA | NA | ULSD | 1050 | 7277 | NA | NA | NA | 2009 | Diesel Oxidation Catalyst | ECS | AZ Purmuffler | NA | NA | NA | NA | \$1,469.00 | included |
| On Highway | Other | Aerial Lifts | 1 | International | C-230 | 2004 | NA | NA | NA | ULSD | 750 | 5248 | NA | NA | NA | 2009 | Diesel Oxidation Catalyst | ECS | AZ Purmuffler | NA | NA | NA | NA | \$1,469.00 | included |
| On Highway | Other | Class 7 | 1 | International | 2000 | 2001 | NA | NA | NA | ULSD | 1100 | 7688 | NA | NA | NA | 2009 | Diesel Oxidation Catalyst | ECS | AZ Purmuffler | NA | NA | NA | NA | \$1,469.00 | included |
| On Highway | Other | Class 7 | 1 | International | 2000 | 2000 | NA | NA | NA | ULSD | 1180 | 8273 | NA | NA | NA | 2009 | Diesel Oxidation Catalyst | ECS | AZ Purmuffler | NA | NA | NA | NA | \$1,469.00 | included |
| On Highway | Other | Class 7 | 1 | International | 2000 | 2000 | NA | NA | NA | ULSD | 1540 | 10794 | NA | NA | NA | 2009 | Diesel Oxidation Catalyst | ECS | AZ Purmuffler | NA | NA | NA | NA | \$1,469.00 | included |
| On Highway | Other | Class 7 | 1 | International | 2000 | 2000 | NA | NA | NA | ULSD | 1470 | 10276 | NA | NA | NA | 2009 | Diesel Oxidation Catalyst | ECS | AZ Purmuffler | NA | NA | NA | NA | \$1,469.00 | included |
| On Highway | Other | Class 7 | 1 | Caterpillar | 3126 | 1999 | NA | NA | NA | ULSD | 730 | 5090 | NA | NA | NA | 2009 | Diesel Oxidation Catalyst | ECS | AZ Purmuffler | NA | NA | NA | NA | \$1,469.00 | included |
| On Highway | Other | Class 6 | 1 | Cummings | B5.9-190 | 1996 | NA | NA | NA | ULSD | 1310 | 9150 | NA | NA | NA | 2009 | Diesel Oxidation Catalyst | ECS | AZ Purmuffler | NA | NA | NA | NA | \$1,469.00 | included |
| On Highway | Other | Class 6 | 1 | International | B5.9-175 | 1994 | NA | NA | NA | ULSD | 100 | 680 | NA | NA | NA | 2009 | Diesel Oxidation Catalyst | ECS | AZ Purmuffler | NA | NA | NA | NA | \$1,469.00 | included |
| On Highway | Other | Class 6 | 1 | International | B5.9-175 | 1994 | NA | NA | NA | ULSD | 770 | 5388 | NA | NA | NA | 2009 | Diesel Oxidation Catalyst | ECS | AZ Purmuffler | NA | NA | NA | NA | \$1,469.00 | included |
| On Highway | Other | Class 4 | 1 | International | 7.3 Liter | 2002 | NA | NA | NA | ULSD | 190 | 1356 | NA | NA | NA | 2009 | Diesel Oxidation Catalyst | ECS | AZ Purmuffler | NA | NA | NA | NA | \$1,469.00 | included |
| On Highway | Other | Class 8A | 1 | Cummins | C8.3 | 1994 | NA | NA | NA | ULSD | 720 | 4943 | NA | NA | NA | 2009 | Diesel Oxidation Catalyst | ECS | AZ Purmuffler | NA | NA | NA | NA | \$1,469.00 | included |

Copy and paste additional lines as necessary to capture project fleet information.

Project 2 Information

| Project Name | Organization Performing Project | Target Fleet | Number of Vehicles | City | County | State | Region | Funding Amount | Additional Funding Source | Additional Funding Amount | Public Benefit |
|--|---------------------------------|--------------|--------------------|------|--------|-------|--------|----------------|---------------------------|---------------------------|----------------|
| ConnDOT Maintenance Truck Retrofit Project | ConnDOT | Other | 26 | | | CT | | \$30,770 | | | yes |

Fleet 2 Information:

| Current Vehicle Information | | | | | | | | | | | | New Vehicle/Technology Information | | | | | | | | | | | | | |
|-----------------------------|-------------|-----------------|---------------|---------------|--------------|-------------------|---------------------------|-----------------------------------|---|-----------------------|--|--|---|----------------------------------|---|-------------------------|--|-----------------|---------------------------|--|---|---|--|----------------------|-----------------------------------|
| Vehicle Type | TargetFleet | Class/Equipment | Vehicle Count | Engine Make | Engine Model | Engine Model Year | Horsepower (Nonroad Only) | Current Tier Level (Nonroad Only) | Current Standard Level for PM and NOx or NMHC+NOx | Fuel Type | Amount of Fuel Used (gal/year for all engines in this row) | Annual Miles per vehicle (On Highway Only) | Annual Usage Rate Hours per engine (Nonroad Only) | Annual Idling Hours (per engine) | Serial and/or VIN # of scrapped engine and/or vehicle | Year of Retrofit Action | Technology Type | Technology Make | Verified Technology Model | New Engine Model Year (for replacements/repowers Only) | New Tier Level (Nonroad replacements/repowers Only) | New Standard Level for PM and NOx or NMHC+NOx | Annual Idling Hours Reduced (per engine) | Technology Unit Cost | Technology Unit Installation Cost |
| On Highway | Other | Class 7 | 7 | International | DT350 | 2000 | NA | NA | NA | Diesel (ULSD), 15 ppm | 11998 | 12000 | NA | NA | NA | 2010 | Diesel Oxidation Catalyst | BASF | CMX Catalyst Muffler | NA | NA | NA | NA | \$1,115 | included |
| On Highway | Other | Class 7 | 15 | International | DT350 | 2001 | NA | NA | NA | Diesel (ULSD), 15 ppm | 25710 | 12000 | NA | NA | NA | 2010 | Diesel Oxidation Catalyst | BASF | CMX Catalyst Muffler | NA | NA | NA | NA | \$1,115 | included |
| On Highway | Other | Class 7 | 2 | International | DT350 | 2002 | NA | NA | NA | Diesel (ULSD), 15 ppm | 3428 | 12000 | NA | NA | NA | 2010 | Diesel Oxidation Catalyst | BASF | CMX Catalyst Muffler | NA | NA | NA | NA | \$1,115 | included |
| On Highway | Other | Class 7 | 2 | Caterpillar | 3121 | 1999 | NA | NA | NA | Diesel (ULSD), 15 ppm | 3428 | 12000 | NA | NA | NA | 2010 | Closed Crankcase Ventilation + ULSD (for | ECS | AZ Purmuffler | NA | NA | NA | NA | \$2,005 | included |

