Mobile Source Pollution Reduction Success Stories

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Abbreviations Used

APU – Auxiliary Power Unit
ARRA – American Recovery and Restoration Act
CCV – Closed Crankcase Ventilation
CO – Carbon Monoxide
CO2 – Carbon Dioxide
DERA – Diesel Emission Reduction Act
DOC – Diesel Oxidation Catalyst
DOT – Department of Transportation
DPF – Diesel Particulate Filter
ECM – Electronic Control Module Reprogramming
EV – Electric Vehicle
FOH – Fuel Operated Heaters
NO_X – Oxides of Nitrogen
$PM_{2.5}$ – Fine Particulate Matter
SCS – Shore Connection System
SEP – Supplement Environmental Project
US EPA – United States Environmental Protection Agency

Introduction

Great strides have been made in the past decade to reduce pollution from onroad and nonroad mobile sources in the Ozone Transport Region (OTR). A major focus has been on reducing pollution by retrofitting, repowering, and modernizing vehicles in the existing fleet, due to the fact that many nonroad and heavy duty onroad vehicles have a much longer usage life than do light duty onroad vehicles. Many of these programs have been funded through US EPA state and federal DERA funds, the ARRA, and state governments. These projects have been undertaken by State agencies individually and in collaboration with private entities. While the primary objective of these projects is the reduction of $PM_{2.5}$, many also provide reductions in NO_X as well.

This document has been produced in order to share information about successful retrofit, repowering, fleet modernization, and idle reduction programs in the OTC member states, the cost associated with these programs, and the amount of reduced emissions. The objective of this report is to provide OTC member states with a compilation of successful mobile source emission reduction projects that can be used as a blueprint for future grant funded projects.

Success Stories

Electricification

Connecticut

EVConnecticut: EVs and EV Charging Infrastructure

EVConnecticut is a partnership of the Connecticut's Department of Energy and Environmental Protection (DEEP) and DOT. EVConnecticut promotes the use of EVs and has focused initial efforts on developing an extensive system of EV charging stations across the state. Using funds made available from the settlement agreement associated with the merger of Northeast Utilities and NStar, EVConnecticut has initiated a successful program to promote the environmental and economic opportunities presented by increased ownership of EVs in the state, including:

- Providing $172,000 in grants to fund the installation of 88 publicly accessible charging stations in 40 cities and towns across the state (see www.ct.gov/deep/evconnecticut for locations such as town halls, train stations, town centers, college campuses, auto dealers and other businesses);
- Deploying six EV fast chargers (EV charging stations that can provide a full charge in around 30 minutes) along Connecticut's highway corridors; and
- Partnering with the Connecticut Automotive Retailers Association in sponsoring the "Connecticut Revolutionary Dealer Award," which will publicly recognize state automobile dealers who sell or lease the highest number of EVs between February 1 and July 31 of 2014.

ZEV Action Plan

Connecticut joined seven other states located on the East and West Coasts in a collaborative multi-state agreement to coordinate EV infrastructure development, including related policies, codes and standards, with the goal of priming the consumer EV market to put 3.3 million zero-emission vehicles (ZEVs) on the road by 2025. The Multi-State ZEV Action Plan is the first promised milestone for the bi-

coastal collaboration to pave the way for increasingly large numbers of the cleanest cars in the nation. The partner states are California, Connecticut, Maryland, Massachusetts, New York, Oregon, Rhode Island and Vermont. Together these states comprise about a quarter of the nation's new car sales.

In accordance with this collaboration, Connecticut is developing its plan to bring energy, environmental, and economic benefits to the state. Under that blueprint, Connecticut will continue efforts to provide a convenient network of charging stations for EVs, add EVs and fuel cell vehicles to the state's fleet, and build out the hydrogen infrastructure needed for fuel cell vehicles expected to be available for the 2015 model year.

MARAMA

City of Annapolis Diesel Emission Reduction Project

With an ARRA-funded sub-award from MARAMA, the Annapolis Harbormaster retrofitted two diesel-powered boats with Steyr Hybrid D electric-diesel propulsion systems. The systems operate the boats on batteries for up to three hours at speeds up to six knots without a requirement to turn the diesel engine on. Three-quarters of the harbor is subject to a six knot speed limit imposed by state law. It takes approximately three to four hours to conduct a routine harbor patrol.

Total cost: $400,575 ($299,519 grant funding)

Lifetime Emission Reduction (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	5.75	1.09	2.10	8.69	17.63

Maryland

Maryland's Electric Vehicle Infrastructure Council

The Electric Vehicle Infrastructure Council (EVIC) was established to look into and make recommendations to the needs of the state to support the deployment of electric vehicles. EVIC has set a goal for state fleet purchases to be 25% zero emission vehicles by 2025. EVIC has also developed recommendations for incentives and legislation aimed at reducing the barriers to electric vehicle deployment, such as exempting charging equipment from regulation as a power provider as well as establishing a tax credit for the purchase of electric vehicles and a rebate for the purchase and installation of charging equipment.

ZEV Infrastructure Incentives

Maryland offers a rebate for the installation of Electric Vehicle Supply Equipment of up to 50% of the cost for equipment and installation. The rebate is capped at $900 for residential installations, $5,000 for commercial, and $7,500 for retail service stations.

The Maryland Attorney General's Office has authorized the use of $1 million dollars from an environmental enforcement action to install a network of electric vehicle DC fast charging stations across Maryland. The program will award grants to companies to cover up to 50% of the cost of installing the fast charging network.

ZEV Vehicle Incentives

A Maryland excise titling tax credit of $125/kW of battery capacity up to $3,000 is available to buyers and leasers of qualifying new plug-in electric vehicles. The credit is available from July 1, 2014 through June 30, 2017. Business entities may also qualify for the tax credit up to 10 vehicles.

Multi-State ZEV Action Plan

Maryland joined seven other states in a collaborative multi-state agreement to coordinate EV deployment and, infrastructure development, including related policies, codes and standards, with the goal of readying the consumer EV market to put 3.3 million zero-emission vehicles (ZEVs) on the road by 2025. The Multi-State ZEV Action Plan is the first promised milestone for the collaboration to pave the way for increasingly large numbers of the cleanest cars in the nation. The partner states are California, Connecticut, Maryland, Massachusetts, New York, Oregon, Rhode Island and Vermont. Together these states comprise about a quarter of the nation's new car sales.

Massachusetts

Massport Fish Pier Electrification Project

MassDEP provided funding to Massport to enable fishing vessels berthed at the Boston Fish Pier associated to switch power from diesel engines to the electrical grid system. The ARRA funding was used to add three power stations to accommodate six vessels.

Total cost: $100,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	CO_2	Total Reduction
Emission Reduction	149.7	10.6	12.1	32.3	5,552.6	5,757.3

Massachusetts Electric Vehicle Initiative (MEVI)

The Massachusetts Electric Vehicle Initiative (MEVI) grew from an Electric Vehicle Roundtable held on March 7, 2013. Over 90 participants provided recommendations to accelerate the deployment of plug-in hybrid, battery, and fuel cell electric vehicles in Massachusetts and made a specific recommendation that a high-level group, the MEVI Task Force, be created. The MEVI Task Force met for the first time on September 30, 2013 and held two subsequent meetings. The MEVI Task Force was assigned to set priorities and make regulatory, policy, and program recommendations based on the deliberations from its three working groups (infrastructure, incentives, and outreach). The Task Force will be issuing its final ZEV Action Plan in September 2014.

Using available funding, Massachusetts has implemented the following programs that address some of the key recommendations outlined in the MEVI ZEV Action Plan and the Multi-State Action Plan (see below):

- MassDEP's Electric Vehicle Incentive Program (MassEVIP) provides $2.5 million in incentives to Massachusetts public and private entities, including municipalities, state fleet, universities and colleges, and driver's education schools, for the acquisition of electric vehicles and charging stations. MassDEP has awarded more than $1.1 million in incentives for 115 electric vehicles and 40 Level 2 dual-head charging stations to fuel them and is currently accepting applications under Phase 3 of MassEVIP.

- The MassEVIP: Workplace Charging Grant program is providing $1.4 million in funding for the deployment of Level 1 and Level 2 electric vehicle charging equipment at workplaces across the Commonwealth. As of September 2014, 133 charging points have been funded at 61 different workplaces (38 employer/property manager entities) for use by employees.

- Massachusetts Offers Rebates for Electric Vehicles program provides rebates up to $2,500 for the purchase or lease of zero-emission and plug-in hybrid electric passenger cars. As of September 2, $559,000 rebate dollars have been reserved or issued for 238 ZEVs. Over $1.8 million has been allocated for this program.

- Massachusetts is using federal and state funding to help create an easily accessible network of public charging stations across the Commonwealth. The state has already spent slightly over $1 million of federal and state funds to install 140 publically available Level 2 charging systems and plans to deploy Fast Chargers to create a Northeast EV Network. As of August, there are 586 public charging outlets throughout the state.

Multi-State ZEV Action Plan

In May 2014, Governor Patrick, along with the governors of seven other states, released a Multi-State ZEV Action Plan to increase ZEVs on the road to a collective target of at least 3.3 million vehicles in the eight states by 2025 and to establish a fueling infrastructure that will adequately support these vehicles. The 8-state action plan identifies the joint cooperative actions that the signatory states must undertake in order to achieve the cumulative goal, but each state must take steps within its own jurisdiction to achieve its specific goal. Massachusetts' participation in this plan sets a bold goal of 300,000 ZEVs or 15 percent of projected registered vehicles in the state by 2025. The Massachusetts ZEV Action Plan identifies actions and strategies that are consistent with the 8-state plan and identifies additional state specific actions that align with the Commonwealth's own climate and renewable energy goals, policies, and current ZEV market.

New Jersey

Ambulance bay electrification

Through two SEPs, the ambulance bays at Underwood Memorial hospital in Camden, NJ were outfitted with electrification technology, and electric plug-ins were installed for nearby short line locomotives. The ambulance bay electrification reduced PM by 0.12 and NO_X by 0.338 tons per year respectively, while the locomotive plug-ins achieved reductions of 0.078 and 2.392 tons per year of PM and NO_X, respectively.

Pennsylvania

Philadelphia International Airport - VALE Projects

The Philadelphia International Airport (PHL) has either begun to implement or implemented a number of emission reduction projects between 2008 and the present. These projects were primarily funded through the Federal Aviation Administration's (FAA) Voluntary Airport Low Emission (VALE) grant funding. VALE helps airport sponsors meet their state-related air quality responsibilities under the Clean Air Act. Through VALE, airport sponsors can use Airport Improvement Program funds and Passenger Facility Charges to finance low emission vehicles, refueling and recharging stations, gate electrification, and other airport air quality improvements. The projects completed at PHL include: purchase of electric-hybrid and full EVs, purchase and installation of preconditioned air units at airport terminals, installation of ground power for a maintenance hangar, purchase and installation of electric ground service equipment charging infrastructure, and purchase and installation hydrant refueling system for

airport equipment and vehicles. The intent of all of these projects is to reduce diesel emissions and fuel use near PHL. The lifetime of the individual airport projects vary from 10 to 40 years.

Emissions reductions over the projects' lifetime (tons)

Pollutant	NO_X	PM	CO	VOC	SO_2	Total Reduction
Emission Reduction	1,179	104	4,532	2,214	174	8,203

Virginia

EVs

Virginia Clean Cities (VCC) created and manages the Virginia Get Ready effort, which recently produced the *Virginia Get Ready: Electric Vehicle Plan*. The goal is to establish Virginia as a leader in the adoption of EVs in order to reduce vehicle emissions, increase energy independence, and generate economic development for the Commonwealth. More information on this program may be found at www.virginiaev.org. The *Electric Vehicle Plan* and other documents created by the program identified local barriers to the installation of public charging stations and other impediments faced by consumers wanting to purchase EVs. Identifying and providing solutions to these barriers enables and encourages more Virginians to purchase these vehicles. Registrations of these vehicles have grown, and this trend is expected to continue.

# of Registered EVs in the Commonwealth of Virginia*					
2008	**2009**	**2010**	**2011**	**2012**	**2013**
435	538	643	735	729	1,257
# of Public Charging Stations in the Commonwealth of Virginia**					
2008	**2009**	**2010**	**2011**	**2012**	**2013**
0	1	4	47	140	212

**Data from Air Division, VDEQ based on registration data from DMV*
***Data from VCC*

Engine Replacements/Repowers

Connecticut

Ferry Engine Upgrade

Using ARRA funds, State DERA funds and significant contribution by the vessel owner, DEEP upgraded two propulsion engines on Cross Sound Ferry's *MV Susan Anne* from Tier 0 to Tier 2 emission level – the first ever Tier 2 engine upgrade of a ferry in the United States.

While expensive, this project yielded impressive NO_X and PM reductions with remarkable cost effectiveness. The cost of replacing an engine on a ship the size of the *MV Susan Anne* is estimated to be nearly twice the cost of upgrading the engine, which would have seriously reduced the cost effectiveness of the pollution reduction gains. In addition, the engine upgrade was accomplished without putting this large vessel in dry dock thus saving the owners a great deal of time and money by allowing the ferry to be returned to operation quickly. As an additional economic benefit, the engine upgrade is projected to save the owners 5,758 gallons of diesel fuel per year.

Total cost: $1,331,116

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction

Emission Reduction	719.4	22.5	See note*	157.7	899.6

*Neither the upgrade kit manufacturer nor US EPA's Diesel Emissions Quantifier projects HC reductions.

Two Marine Repower Projects

Using State DERA funds and a contribution from the vessel owner, D. Brake Marine, LLC, DEEP replaced the propulsion engines on tugboat *Gotham*, bringing it from Tier 0 to Tier 2 emissions level. Using State DERA2 funds and Connecticut DOT funds, DEEP replaced the propulsion engines on the DOT-operated Chester/Hadlyme Ferry, *Selden III*.

Total cost: $401,980

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	139.02	1.24	See note*	11.69	151.95

*The Diesel Emissions Quantifier does not project HC reductions from a marine engine repower.

Delaware

Port of Wilmington

1 Terex payloader, 1 Top Pick loading vehicle and 2 Raygo loading vehicles with Tier 0 engines were replaced with Tier 3 engines. The loading vehicles are primarily used during the months of October to March for unloading freight from ocean going vessels. The Terex is primarily used for snow removal.

Total cost: $288,000

Wilmington Tug Company

Tug boat with two Tier 0 propulsion engines were replaced with two Tier 2 propulsion engines.

Total cost: $770,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	497	27	18	112	654

Parks and Recreation Tractor Engine Replacement

The second project funded the replacement of diesel engines in seven tractors owned by the State of Delaware Division of Parks and Recreation. The Parks and Recreation tractor engine replacement project will spend approximately $60,000 on new engines for utility tractors that operate throughout Delaware.

Total Cost: $156,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total reduction
Emission Reduction	1.8249	0.1572	0.1264	0.7184	2.8269

District of Columbia

Marine Vessel Retrofit

Using DERA funds, in 2012 DDOE and MWCOG began a project to replace four diesel engines on the Passenger Vessel Spirit of Mt Vernon that operates on the Potomac River in the District of Columbia.

Two propulsion engines and two gensets will be replaced. The engines have been purchased and was installed in early 2013.

Total Cost: $724,935 (grant funding of approximately $427,000, remainder funded by the owner)

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	Total Reduction
Emission Reduction	31.3	1.5	32.8

AMTRAK Switcher Repower

AMTRAK, Brotherhood of Locomotive Engineers and Trainmen and MWCOG replaced two diesel switchers that are used at Union Station in DC with cleaner gensets.

Maine

Commercial Marine Engine Repower

The Maine Department of Environmental Protection (DEP) received a competitive award to repower a mid-water trawler, a whale watch vessel, a fishing boat, and a small tugboat owned by Maine Maritime Academy which operates as a training vessel for the cadets. The project will reduce annual NO_X emissions by 65% and PM emissions by 84%.

Grant Award: $1,255,197
Total Cost: $2,532,514

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	Total Reduction
Emission Reduction	308.2	16.9	325.10

Ferry Engine Repower

The Maine DEP received a competitive DERA award to replace two Tier 0 propulsion engines on the Maine State Ferry *Governor Curtis* which operates approximately 300 days of the year as the primary spare vessel for one of five ferries which operate daily. The project also replaced two Tier 0 propulsion engines on the *Pink Lady II,* a whale watch boat which operates from Boothbay Harbor carrying an average of 25,000 passengers a year. The projects reduced annual NO_X emissions by 44% and PM emissions by 21%.

Grant Award: $250,000
Total Cost: $550,00

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	Total Reduction
Emission Reduction	84.6	0.8	85.4

Maine Clean Marine Engine Program

The Maine DEP established the first statewide commercial vessel repower program in a unique collaboration with Maine Marine Trades Association whom administered the program. Grant funding from ARRA, and both competitive and state DERA grant funds repowered 85 vessels, mostly commercial

lobster boats. Other vessels repowered included: two aquaculture boats; five excursion boats; a schooner, the Isle au Haut mail boat; the Cranberry Island Ferry, the *Sunbeam* which serves the island communities; and three research vessels including the famous sailboat *American Promise,* the *Gulf Challenger* owned by UNH, and *J. B. Heiser,* owned by Cornell University which ferries students to the Isle of Shoals laboratory. The program also demonstrated the first electric engine installed in Maine in a sailboat. The projects reduced annual NO_X emissions by 32% and PM emissions by 60%.

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	Total Reduction
Emission Reduction	215.2	18.2	233.4

Grant Award: $2,131,401
Total Cost: $5,586,936

MARAMA

Cleveland Brothers Off-Road Construction Project (Pennsylvania)

With an ARRA-funded sub-award from MARAMA, Cleveland Brothers upgraded two pieces of off-road construction equipment to a higher US EPA Tier level using US EPA Verified components, and repowered 15 pieces of off-road construction equipment, i.e., replaced older engines with higher US EPA Tier engines.

Total cost: $1,095,483 ($821,691 grant funded)

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	524.94	41.35	54.38	317.31	937.98

CSXT Switch Locomotive Engine Repower (Maryland)

With support from an ARRA-funded sub-award from MARAMA, CSXT repowered an old switch locomotive from a single engine to a multi-engine genset locomotive. A switch locomotive (switcher) is used primarily for rail yard operations, and is typically an older locomotive that was underpowered for modern line haul duty. This engine is used in the Baltimore area.

Total cost: $1,425,000 ($947,625 grant funded)

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	Total Reduction
Emission Reduction	325.7	11.42	30.41	367.53

Repower of 37 Year-old Tug "Bering Sea"

With National DERA funds, the Mid-Atlantic Regional Marine Diesel Emission Reduction Project supported K-Sea Transportation Partners L.P.'s early replacement of two model year 1975 propulsion engines and two model year 1975 auxiliary engines with new model year 2010 US EPA Tier II engines. With an estimated 75 % of the tug's operations in US EPA Region 3 waters, 75 % of the reductions will

occur in Region 3. It's estimated that 50% of the Bering Sea's operations will be in the Philadelphia area, 25% in the upper Chesapeake Bay, and 25% in the Hampton Roads area.

Total cost: $1,145,393 ($486,800 grant funded)

Lifetime Emission Reductions, Region 3 (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	203.5	6.08	3.25	28.72	241.55

Maryland

Locomotives

Using ARRA funds, installed start/stop idle control devices on 10 locomotives. The retrofit resulted in idle reduction of 5,877 hours/year.

Total cost: $309,476

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	73.5	3.93	11.67	35.40	124.49

Harbor Craft

Using ARRA funds, replaced the main and auxiliary engines of tugboat Kaleen McAllister (1 main, 2 auxiliary engines), dinner cruise vessel Inner Harbor Spirit (2 main, 2 auxiliary engines), and Maryland Port Authority harborcraft Endeavour (1 main, 2 auxiliary engines). A total of 10 engines were replaced. All engines were upgraded from Tier 0 to Tier 2 emission levels.

Total cost: $1,599,730

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	435.02	19.06	1.15	46.82	502.05

Massachusetts

MBTA Locomotive Head End Power Repower Program

MassDEP provided ARRA, DERA, and SEP settlement funds to the Massachusetts Bay Transportation Authority (MBTA) to repower 18 head-end power (HEP) generator sets in its commuter locomotive fleet. HEP generators supply electrical power used for heating, cooling, and lighting the passenger coaches. Although much smaller than main locomotive engines (670 horsepower versus 3,000 hp), HEP engines typically consume 40 percent or more of the diesel fuel used by a locomotive and emit a substantial amount of the total emissions.

Total cost: $1,793,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	260.6	18	14.5	133.4	426.5

NESCAUM

CSX Locomotive Genset Repower & Retrofit Project

Using SEP funds provided by PSEG Fossil LLC and directed to this project by New Jersey DEP, each of three switcher locomotives was repowered with two generators sets meeting Tier 3 emission standards. Each generator set was retrofitted with a DPF to achieve emissions equivalent to a Tier 4 standard. These locomotives are operating in switch yards in Northern New Jersey.

Total cost: $4,742,374

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	Total Reduction
Emission Reduction	475	28	503

CSX Locomotive Genset Repower Project

Under a DERA-ARRA grant, a switcher locomotive operating in New Haven, CT was repowered with three generator sets meeting Tier 3 emission standards. In addition to the emissions benefits, there is an annual fuel savings of 15,000 gallons.

Total Cost: $1,400,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	Total Reduction
Emission Reduction	166	5	171

Marine Vessel Engine Repower/Upgrade Projects

Under two separate DERA-ARRA grants, a combination of 29 propulsion and auxiliary engines were repowered in 10 marine vessels. Two engines in another vessel were upgraded with certified NO_X rebuild kits. The vessels operate in Maine, New Hampshire, New York, Vermont, and Puerto Rico.

Total cost: $6,771,024

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	CO_2	Total Reduction
Emission Reduction	1096	81.5	6030	7207.5

Tower Gantry Crane Repower Project

Under a DERA grant, 17 crane power modules are being repowered with new Tier 3 engines. These modules are principally used in cranes on construction sites in New York and New Jersey.

Total cost: $1,822,223

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	Total Reduction
Emission Reduction	416	32	448

South Jersey Port Cargo Equipment Repower/Retrofit Project I

Under a CARE grant provided by US EPA, supplemented by SEP funds directed to the project by New Jersey DEP, 6 units of cargo handling equipment were repowered with new engines and an additional 4 units were retrofitted with DOCs.

Total cost: $750,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	Total Reduction
Emission Reduction	342	56	398

South Jersey Port Cargo Equipment Repower Project II

Under a DERA grant, approximately 30 units of cargo handling equipment at the port in Camden, NJ are being repowered with new engines meeting Tier 2 and Tier 3 emission standards.

Total cost: $1,463,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	CO_2	Total Reduction
Emission Reduction	352	34	720	1106

New Jersey

Switcher Locomotives

Two switcher locomotives owned by CSX Transportation and Norfolk Southern Railway Company were upgraded through the installation of Genset technology, which reduced fuel consumption by 25%. Emission benefits over a five-year period include 185 tons of NO_X and 4.7 tons of $PM_{2.5}$. A similar project was also completed involving 3 switcher locomotives operating at Port Newark and Elizabeth.

Pennsylvania

Long-Haul Trucking - State Clean Diesel Program

Using Diesel Emissions Reduction Grant funds, Hoopes Turf Farm (HTF), Inc. was awarded a 2011 PA State Clean Diesel Grant of $285,000. HTF has replaced six heavy-duty, long-haul, diesel-powered trucks in their fleet with six liquefied natural gas (LNG) fueled trucks. Each of the six LNG-fuel trucks has a working radius of 300-350 miles. The project entails the purchasing of six 2013 Peterbilt™ Model 388 LNG-fueled tractors each with two fuel tanks, that offer longer range. HTF spent an additional $450,000 on a 6,000-gallon Automated LNG Mobile Fueling System that will be made available for public access. HTF's public-access LNG fueling system will be the first in Pennsylvania and only the second in the nation east of the Mississippi River. HTF will also save about 120,000 gallons of fuel annually.

Lifetime emission reductions (tons)

Pollutant	NO_X	PM	CO	Total Reduction
Emission Reduction	13	0.5	1,110	1,123.50

Marine Diesel Engines – Emerging Technology Grant

CONSOL Energy, operating in the Pittsburgh area, upgraded the engines on a Pittsburgh based towboat, Champion Coal. This included field testing an engine emissions upgrade kit manufactured by Caterpillar that was developed to satisfy the U.S. US EPA new emission standards for class 2 marine engines. This project was a continuation of previous phases of work on upgrading the engine by Caterpillar and will

reduce air pollution in the Pittsburgh area which has some of the highest concentrations of pollution in Pennsylvania. Testing showed that the kit exceeded US EPA requirements.

Lifetime emission reductions (tons)

Pollutant	NO_X	PM	CO	VOC	Total Reductions
Emission Reduction	650	16	90	9	765

Locomotives – National Clean Diesel Grant Program

Norfolk Southern received a $1.5 million dollar grant for their $3.4 million Mother/Slug Re-power Project. The Mother/Slug Re-power Project replaces a total of four pre-1973 four-axle 2000 horsepower engines with two larger engines with advanced technology, resulting in reduced fuel consumption and accelerated diesel emission reductions. This Mother/Slug pair effectively replaces two existing pre-1973 locomotives performing the same function, but uses one engine. The single engine that replaced the two older engines is 25% to 38% more fuel efficient depending on duty cycle and has reduced emissions.

Lifetime emission reductions (tons)

Pollutant	NO_X	PM	VOC	Total Reduction
Emission Reduction	1,890	44	99	2,033

Virginia

VPA Green Operator Program

VPA's Green Operator (GO) Program provides incentives to truck operators to retrofit or replace older engines and exhaust systems to improve emissions. At the close of 2011, 250 vehicles had participated in the program. The VPA estimated the potential contribution of this program toward overall emissions improvements using the following assumptions:

- 183 trucks were retrofitted to generate the equivalent emissions of a 2004 engine.
- 67 trucks replaced their engines with 2008 equivalent models.
- Each truck is assumed to make 2 or 3 trips daily to the terminal on about 250 days annually.

Emissions from the annual trips were calculated using MOVES2010B and compared to trucks in the expected age range to determine the current benefits from the program. The NO_X benefits are shown in the table below.

Annual Emission Reductions 2011 (tons)

	2 Trips Daily	3 Trips Daily
Baseline	87	131
GO Program	55	83
Benefit	***32***	***48***

Data Source: Virginia Port Authority 2011 Air Emissions Inventory, Appendix A, Page A-4

An additional 100 dray trucks (2003 model year or older) will be retrofitted or replaced through $1,680,000 provided from CMAQ funds in years 2013 through 2015 from the Richmond Area Metropolitan Planning Organization.

VRE Engine Replacements

Virginia Railway Express (VRE) replaced older Tier 0 engines with 20 new, fuel-efficient Tier 2 engines in mid 2011. These new engines were funded via the ARRA TIGER program. These new engines emit much less NO_X, VOC, and CO than the older engines, and this project has resulted in significant reductions of these pollutants.

Vermont

School Bus Replacement

Using ARRA-DERA funds, DEC provided technical assistance and cost-matching grants to Vermont school districts to improve air quality and help protect public health through the early replacement of 43 older, more heavily polluting school buses with new buses equipped with state-of-the-art emissions control systems and idle reduction technology. Programmable diesel-fired coolant heaters are projected to save an estimated 129,568 gallons of diesel fuel over the remaining life of the buses.

Total cost: $3,410,000 ($1,730,000 grant funding)

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	CO_2	Total reduction
Emission Reduction	130.6	3.0	3.4	14.4	1,438.2	1,589.6

Sawmill Repower

Through this demonstration project, DEC provided financial and technical assistance to Vermont sawmills to repower generator equipment with lower-emitting stationary diesel engines and helped to evaluate this sector as a potential target for future efforts to reduce diesel emissions. Each of the four sawmills approved for engine replacement received a 50 percent cost-matching grant and technical assistance in repowering the equipment with lower-emitting diesel engines that resulted in emissions reductions of up to 80%.

Total cost: $200,000

School Bus Replacement

Using DERA funds, DEC provided technical assistance and cost-matching grants to Vermont school districts to improve air quality and help protect public health through the early replacement of 17 older, more heavily polluting school buses with new buses equipped with state-of-the-art emissions control systems and idle reduction technology. Programmable diesel-fired coolant heaters are projected to save an estimated 56,916 gallons of diesel fuel over the remaining life of the buses.

Total cost: $1,316,000 ($701,000 grant funding)

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	CO_2	Total reduction
Emission Reduction	50.1	2.1	1.8	6.7	631.8	692.5

Idling Reduction

Connecticut

Since 1972, Connecticut law has prohibited vehicles of all kinds from unnecessary idling for more than three minutes. Provisions are made for weather extremes, certain service vehicles and health-related conditions. R.C.S.A. 22a-174-18 applies to ALL vehicles in Connecticut and is enforced by DEEP Field Staff. Public Act No. 02-56**,** An Act Concerning the Idling of School Buses, gives ticketing authority to police who witness school buses idling for longer than three minutes.

Outreach and Education

Connecticut initiated an outreach and education program to reduce the idling of school buses. This successful program has resulted in the posting of close to 2000 "No Idling" signs at schools around the state. Many schools also distributed education and outreach materials to students and their families. In addition to schools, these "No Idling" signs have been posted at the Connecticut Department of Motor Vehicles offices and at over 200 Motor Vehicle Inspection and Maintenance Testing Stations. Anti-idling outreach events have occurred at the Connecticut Legislative Office Building and numerous health fairs.

Clean Diesel Program

Connecticut provided grants for two projects involving early replacement of diesel trucks equipped with automatic shut-off technology to reduce idling emissions and lower fuel costs. Additionally, five DERA recipients have developed driver awareness programs to promote idle reduction.

Delaware

Diesel Engine Idling Reduction - Smyrna Rest Area

24 electrified truck parking spaces were installed at this rest area where the majority of the long haul truck traffic makes deliveries to the Walmart distribution center, two miles away.

Total cost: $548,000

Trinity Trucking

20 reefer electrification outlets were installed. The electrical outlets replaced the need for truck idling that previously supplied the power to the trailer refrigeration units parked at the trucking company's facility in Wilmington which operated primarily on the weekend.

Total cost: $250,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	CO_2	Total Reduction
Emission Reduction	2,013	6	12,355	14,374

Maine

Idling Requirements for Motor Vehicles

In 2007, the Maine Legislature enacted Maine's Idling Requirements for Motor Vehicles statute limiting idling of commercial vehicles. Maine based its ordinance on an EPA Model State Idling Law. Municipalities, schools, and universities have also adopted anti-idling ordinances and policies.

MARAMA

Truck Engine Idle Reduction

With funding from an US EPA Region 3 grant, MARAMA provided 50 percent of the cost of APUs to eligible and approved independent truck owner/operators and small transport company applicants in Delaware and Pennsylvania.

Total cost: $84,000 ($42,000 grant funded)

Annual Emission Reductions (tons)

Pollutant	NO_X	PM	Total Reduction
Emission Reduction	2.58	0.036	2.62

Maryland

Maryland Idle Reduction Technology Grant Program

Using State DERA funds, MDE and MEA established an idle reduction technology grant program to provide financial assistance for the purchase and installation of idle reduction technology on trucks. Under the program APU were installed on 54 trucks and FOH were installed on four trucks.

Total cost: $225,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	CO2	Total Reduction	Fuel Savings
Emission Reduction	556	13.1	23,262	23,831	2,095,694

Massachusetts

Providence and Worcester Railroad Idle Reduction Program

Installed idling reduction technologies on 22 locomotives with SEP funds.

Total cost: $475,000

NESCAUM

Providence & Worcester Railroad Idle Reduction Program

Under a DERA Grant, APUs were installed on 17 locomotives, operating in Massachusetts, Rhode Island, Connecticut, and New York. The project is expected to reduce annual idling by 25,500 hours and fuel consumption by 51,000 gallons.

Total cost: $535,250

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	CO_2	Total Reduction
Emission Reduction	212	6.8	5779	5997.8

New Jersey Vehicle Idle Reduction Project

Using SEP funds provided by Valero Energy Corporation and directed to this project by New Jersey DEP, an ambulance plug-in station was established at Underwood Memorial Hospital in Woodbury, NJ. In addition, a locomotive block heater plug-in station was built at the Valero Refinery, in Paulsboro, NJ. As a result, idling was reduced by 9200 hours per year.

Total cost: $230,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	Total Reduction
Emission Reduction	27.3	0.9	28.2

New England Locomotive Idle Reduction Project

Under a DERA grant, 29 locomotives, owned and operated by 8 regional railroads in Connecticut, Massachusetts, New Hampshire, and Vermont are being equipped with APUs. As a result idling will be reduced by 44,200 hours annually.

Total cost: $1,110,722

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	CO_2	Total Reduction
Emission Reduction	370	11	23,000	23,381

New Jersey

New Jersey Transit Idle Reduction

New Jersey Transit (NJT), working with NJDEP and NESCAUM, has instituted a two-pronged approach to idle reduction in their locomotives, encompassing both policy changes and technological updates. NJT has installed automatic shutdown devices on 33 NJ Transit PL-42 locomotives. They have revised their policy for trains entering or leaving their train yard, limiting idling to no more than 1 hour per day per locomotive. The installations reduced emissions of PM by 1.86 tons per year and NO_X by 74.95 tons per year, while the policy change dropped PM by 14.8 tons per year and NO_X by 592 tons per year.

New Hampshire

Locomotive Idle Reduction Project

Using DERA funds, the New Hampshire Department of Environmental Services (DES) provided the New England Southern Railroad Co., Inc. ("NES") $28,000 to purchase and install a Hotstart® DV coolant heating system and battery charger. Locomotive engines are typically designed to use water for engine cooling. However, the water can freeze in cold weather and crack the engine block. As a result, shutting locomotives off in cold weather has historically been avoided as much as possible. The coolant heating system eliminates that idling completely and has the potential to save of 6,000 gallons of fuel annually and avoid 25 tons of nitrous oxide emissions.

Total cost: $28,000

Idle Reduction Technology

Using $232,000 of ARRA funds, idle reduction equipment was supplied to eleven long haul trucks, nine transit buses, seven intercity buses and eight school buses.

Total cost: $232,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	CO_2	Total Reduction

Emission reduction	117	2.9	5227	5347

New Hampshire is also funding schools bus additional idle reduction projects via its DERA state program.

Ambulance Anti–Idling Kiosks

In 2013, Frisbie Memorial Hospital, Rochester, NH, was awarded $19,000 in DERA funds to install two "MediDock" ambulance anti-idling kiosks. Ambulances often idle for extended periods in order to keep electronic medical devices charged and to keep patients and pharmaceutics at proper temperature. Ironically, ambulances often idle directly outside emergency rooms where their emissions can affect patients. In the first year after being installed, the kiosks were used for a total of 3,516 hours. These two kiosks were installed as demonstrators for other hospitals and shortly after their installation, Lakes Region General Hospital applied for similar DERA funding and installed two kiosks outside their emergency room.

Lifetime Emission Reductions (pounds)

Pollutant	NO_X	PM	CO_2	Total Reduction
Emission Reduction	28.7	17.8	45.3	69.4

Vermont

Idle Reduction Technology for Emergency Response Vehicles

DEC used DERA funds to develop and implement a project for the installation of 4 shore power-type electrification "kiosks" at two Vermont hospitals to power onboard equipment and provide cabin climate control for emergency-response vehicles and help reduce exposure of sensitive populations to harmful diesel exhaust. As a first deployment of this idle reduction technology, the project serves as a demonstration for other hospitals in improving local air quality, reducing potential exhaust infiltration of hospital buildings, reducing greenhouse gas emissions, and increasing the energy efficiency of emergency services. Through the deployment of this technology at two hospital campuses, an estimated 83,950 gallon reduction in diesel fuel consumption will also be achieved.

Total cost: $123,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	CO_2	Total reduction
Emission Reduction	25.3	0.7	0	0	931.8	957.9

Pollution Controls

Connecticut

School Bus Retrofits

Using State DERA funds in conjunction with a State legislative allocation from Public Act 07-4, the Connecticut Department of Energy and Environmental Protection (DEEP) retrofitted 353 school buses with DOCs and CCVs. This program successfully met the demand for school bus retrofits in the state.

Total cost: $870,044

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total reduction
Emission Reduction	0	8.39	25.59	95.93	129.91

Highway Maintenance Truck Retrofits

Using ARRA and National DERA funds, in two projects, DEEP retrofitted the Connecticut DOT's entire fleet of 175 highway maintenance trucks with DOCs.

Total cost: $196,905

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	0	1.19	13.90	34.73	50.54

Highway Construction Equipment Retrofits

Using ARRA funds, DEEP retrofitted 19 pieces of highway construction equipment with DOCs, and five with DPFs. The equipment is working on DOT projects in Fairfield County, which was at the time of project completion designated as nonattainment for both the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS. However, as of October 24, 2013 US EPA redesignated this area to attainment for these standards. The total emission reduction was small, but achieved cost effectively. The cost to reduce PM in the retrofitted equipment was $65,000/ton, and for the DOCs alone, was $35,000/ton.

Total cost: $198,463

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	0	3.06	4.61	15.75	23.42

DEEP Truck Retrofit

Using National DERA funds, DEEP retrofitted all thirteen of the eligible trucks in its fleet with DOCs.

Total cost: $19,097

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	0	0.13	0.48	0.99	1.60

Delaware

Delaware Transit Corporation

7 Gillig Low Floor buses with 2006 Cummins ISM engines and 7 Gillig Low Floor buses with 2000 Cummins ISM engines were retrofitted with DPFs. These buses are operated by the State of Delaware's DTC in northern Delaware in New Castle County.

Total cost: $160,000

Seven School Bus Owners

118 buses ranging in engine model years 2002 -2006 were retrofitted with DPFs. 56 of those buses also had CCV systems installed. The school buses are operated throughout the state in all three counties by school districts and one private company.

Total cost: $1,425,000

Three Municipal Public Works Departments

32 heavy duty utility trucks were retrofitted with DPFs. These trucks are operated in New Castle and Kent Counties for the cities of Wilmington, Newark and Dover.

Total cost: $520,000

Port of Wilmington

2 ship-to-shore cranes and 2 yard jockeys were retrofitted with DOCs. The cranes and yard jockeys are operated by the Diamond State and are primarily used during the months of October to March for unloading and transporting freight from ocean going vessels.

Total cost: $492,200.00

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	N/A	13.5	43.4	141	198

Maine

Maine Clean School Bus Program

Maine DEP was awarded grants from EPA's *Clean School Bus USA* program to fund the first state wide school bus retrofit program. The program funded the retrofit of 568 school buses with DOCs and/or CCV systems. The Department in collaboration with the Maine Association of Pupil Transportation, Maine Department of Education, and the Asthma Regional Council of New England launched the successful *Clean Air Zone* campaign promoting reduced idling on school buses and around school yards. The Union of Concerned Scientists in 2005 gave Maine high marks as one of the top five states in the country with a successful school bus cleanup program.

Clean Cities and DERA grant funds replaced 14 diesel school buses with compressed natural gas (CNG) for Portland Public Schools, founding the largest CNG school bus fleet in the northeast. DERA grant funds also replaced 17 diesel school buses with propane at four Maine school districts. In addition, the program funded 150 factory installed fuel-fired auxiliary heaters on new school buses.

Grant Award: $2,131,401
Total costs: $5,586,936

MARAMA

Maryland State Highway Administration (SHA) On-Road Retrofits

With an ARRA-funded sub-award from MARAMA, SHA retrofitted 181 dump trucks, model years 1990 – 2004, with high-efficiency DOCs. The dump trucks operate in eleven counties throughout Maryland: Anne Arundel, Baltimore (including Baltimore City), Calvert, Carroll, Charles, Frederick, Harford, Howard, Montgomery, Prince George's, and St. Mary's.

Total cost: $251,764 ($231,154 grant funded)

Lifetime Emission Reductions (tons)

Pollutant	PM	HC	CO	Total Reduction
Emission Reduction	10.54	12.75	52.87	76.16

Montgomery County Equipment Retrofits

With an ARRA-funded sub-award from MARAMA, Montgomery County retrofitted county vehicles and off-road engines with DPFs and DOCs to reduce the diesel emissions. Specifically, 15 dump trucks, 12 delivery trucks, and five off-road engines were retrofitted with DPFs; and DOCs were fitted to 26 dump trucks and 14 delivery trucks. Montgomery County also installed cleaning units and DPF monitoring panels in several locations.

Total cost: $531,019 ($523,607 grant funded)

Lifetime Emission Reductions (tons)

Pollutant	PM	HC	CO	Total Reduction
Emission Reduction	30.23	42.57	207.63	280.43

Pittsburgh Waste Hauler Retrofits

With a sub-award funded by an US EPA Region 3 grant to MARAMA, the City of Pittsburgh retrofitted 13 waste haulers with DPFs. This demonstration project highlighted the emission reduction capability of DPFs on waste haulers and addressed potential installation and operational barriers. Based on the success of this demonstration, the City of Pittsburgh applied for US EPA funds to retrofit 33 additional waste haulers.

Total cost: $163,000 ($163,000 grant funded; the City of Pittsburgh provided in-kind staff resources and expertise to facilitate the program)

Lifetime Emission Reductions (tons)

Pollutant	PM	HC	CO	Total Reduction
Emission Reduction	0.69	0.87	4.14	5.7

Philadelphia Fire Truck Retrofits

With a sub-award funded by an US EPA Region 3 grant to MARAMA, the City of Philadelphia retrofitted 68 fire engines with DOCs. The retrofitted fire trucks serve 53 fire houses throughout Philadelphia. This demonstration project highlighted the emission reduction capability of DOCs on fire trucks and addressed potential installation and operational barriers.

Total cost: $148,447 ($89,000 grant funded)

Lifetime Emission Reductions (tons)

Pollutant	PM	HC	CO	Total Reduction
Emission Reduction	0.35	2.05	4.94	7.34

Maryland

Maryland Port Administration (MPA) Crane Retrofits

With a sub-award funded by an US EPA Region 3 grant to MARAMA, the MPA retrofitted two cargo-handling cranes with DOCs. This demonstration project highlighted the emission reduction capability of DOCs on port cargo-handling equipment and addressed potential installation and operational barriers. Based on the success of this demonstration, MPA applied for and was awarded an ARRA grant that included funding for additional cargo-handling equipment retrofits.

Total cost: $24,889 ($12,500 grant funded)

Annual Emission Reductions (tons)

Pollutant	PM	VOC	CO	Total Reduction
Emission Reduction	0.0116	0.038	0.35	0.4

Cargo Handling Equipment

Using ARRA funds, installed 21 retrofits DOCs, repowered 20 pieces of equipment and replaced 1 piece of equipment. This program was a joint effort between MDE, Maryland Environmental Service and Maryland Port Authority.

Total cost: $508,332

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	73.5	8.67	11.39	32.89	127.79

Dray Truck Program

Using ARRA funds, installed 18 retrofits (14 DPF, 4 DOC), replaced 4 vehicles (2007 vehicles), and repowered 1 truck with 2007 engine. This program was a joint effort between MDE, Maryland Environmental Service and Maryland Port Authority.

Total cost: $320,574

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	n/c	1.91	5.4	21.09	28.4

Maryland School Bus Grant Program

Using National and State ARRA funds, DPF and CCV systems were installed on 203 county owned school buses. FOHs and timers were installed on 50 school buses, and FOH timers were installed on 31 school buses. Baltimore, Frederick, Harford, Montgomery, Prince George's, Queen Anne's and Washington counties participated in the program.

Total cost: $2,482,815

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	CO2	Total Reduction	Fuel Savings
Emission Reduction	4.7	9.1	16	87	155	207.6	13,946

School Bus Retrofit Grants

Using DERA funds, DPF and CCV systems were installed on 21 county owned school buses. Additionally, 3 CCV systems were installed on contracted school buses. Kent, Prince George's and Washington counties participated in the program.

Total cost: $224,928

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	0	0.7	1.6	8.0	10.3

Montgomery County DPF Cleaner

In order to properly maintain the filters used by the retrofitted vehicles, an Engine Control Systems Combiclean automated unit that automatically both bakes the filter and uses air to remove residual ash was purchased. Recently DPF retrofitted vehicles include 3 rubber tire loaders used by Department of Solid Waste and 12 delivery trucks used by the Department of Liquor Control.

Total cost: $17,149

County Fleet Retrofit Grants

Using US EPA Grant and State DERA funds, diesel particulate filters and closed crankcase ventilation systems were installed on 19 local government trucks. Participating jurisdictions were Charles County, City of Gaithersburg and City of Rockville.

Total cost: $297,029

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	0	2.1	47	143	192

Maryland Port Administration (MPA) Retrofits

Using State funds, 12 rubber tire gantries, six yard jockeys and two trucks were retrofitted with DOCs.

Total cost: $132,079

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	0	2.1	5.5	16.4	24.0

Prince George's County Thermal Wraps

A year after 85 school buses were retrofitted with passive DPF, some of the buses required filter cleaning earlier than anticipated and were right on the borderline of the required heat needed for the DPFs to regenerate and burn the soot into ash. Further investigation revealed that the engine duty cycle had changed since the initial exhaust temperatures were taken as a result of changes to assigned bus routes and due to different driving characteristics of the drivers. To resolve the issue, thermal blankets were installed on the section of exhaust pipe from the turbo to DPF to retain the temperature in the heat range for the DPFs to regenerate.

Total cost: $50,425

Construction Equipment Retrofits

Using EPA funds from a NCDC Grant, DPFs were installed on four rubber tire loaders owned by Montgomery County and City of Baltimore.

Total cost: $50,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	0	2.0	2.7	7.9	12.6

Emergency Response Vehicle Retrofits

Using US EPA funds from the Sensitive Populations Grant, a total of 81 emergency response vehicles including fire trucks, ambulances and hazmat vehicles were retrofitted with DOCs. Participating jurisdictions were City of Annapolis, City of Baltimore, Montgomery County and Maryland Department of the Environment.

Total cost: $89,120

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	0	1.1	43.3	428.3	472.7

Construction Equipment Vehicle Retrofits

Using funds from the US EPA Sensitive Populations Grant and the State of Maryland funds were used to install DOCs on 7 Montgomery County dump trucks.

Total cost: $7,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	0	0.05	2.13	20.34	22.52

Transit Bus Retrofits

$66,000 was issued by Maryland Department of the Environment's (MDE) Air and Radiation Management Administration (ARMA) to retrofit 18 Howard County transit buses with DOCs, re-flashing, and CCVF systems.

Total Cost: $66,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	23.37	0.23	15.21	36.26	75.07

School Bus Retrofits - SEP

Dominion Resources, Inc. (formerly VEPCO - Virginia Electric Power Company) awarded the sum of $600,000 to the Maryland Department of the Environment (MDE) for the implementation of projects that reduced emissions from 403 school buses. Anne Arundel County Public Schools retrofitted 43 school buses with DOCs and 8 school buses with DOC and Spiracle CCV filtration systems. Montgomery

County Public Schools retrofitted 171 school buses with DOCs and 80 International school buses (T444E engines) with International "Green Diesel" technology (DOCs and reflash. Prince George's County Schools retrofitted 101 school buses with International's "Green Diesel" Technology (DOCs and reflashing).

These retrofits resulted in the following annual emissions reductions: 82.24 tons of CO, 13.32 tons of HC, 0.32 tons of PM, and 9.25 tons of NO_X.

Total Cost: $600,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	9.25	0.32	13.32	82.24	105.13

Baltimore City Fleet Retrofits

The U.S. EPA Air Toxics Grant for Diesel Retrofits funded three separate projects for the City of Baltimore: $160,000 to retrofit 98 load packers with DOCs and CCV filtration systems; $30,000 to retrofit 23 dump trucks with DOCs and CCVF systems; and $40,000 for Maryland Transit Administration (MTA) to install Clever Devices BusLink Switches on 40 Neoplan transit buses in order to reduce bus idling.

Total Cost: $230,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	159.5	2.02	56.97	851.86	479.99

Johns Hopkins University Vehicle Retrofits

$10,000 was issued by the State of Maryland to Johns Hopkins to install DOCs on 16 school and coach buses used for transport between different branches of the university and hospital.

Total Cost: $1,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	0	0.13	4.34	41.39	45.86

Baltimore City School Bus Project

Under a USEPA Region III Clean School and City grant, 19 Baltimore city school buses were retrofitted with partial DPFs, DOCs, and/or CCVs. Due to decreased costs, 22 school buses were outfitted with auxiliary engine heaters, saving idling warmup time.

Total Cost: $73,600

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	11.78	0.33	0.12	0.3	12.53

Toyota Clean Buses for Kids Project

Using a grant of $90,000 from the Toyota Clean Buses for Kids, DPFs were installed on 12 Baltimore City school buses.

Total Cost: $90,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	0	0.05	0.63	7.46	8.14

Congestion Mitigation and Air Quality Improvement Program

Utilizing a grant from the Congestion Mitigation and Air Quality Improvement Program, the Baltimore Regional Transportation Board worked with MDE and county governments to purchase or retrofit public utility vehicles. Baltimore City Department of Public Works purchased two diesel hybrid bucket trucks and installed DPFs on 13 dump trucks. Howard County purchased three diesel hybrid transit buses.

Total Cost: $1,042,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	27.6	1.09	1.53	3.64	33.86

Inter County Connector and Merritt Mid-Atlantic SEP School Bus Project

Using a Supplemental Environmental Project grant, from the Maryland Inter County Connector project, 9 public school buses from Prince George's County and 70 from Montgomery County had DPF of combination DPFs and CCV systems installed.

Total Cost: $1,075,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	0	2.67	6.94	34,55	44.16

Baltimore Washington International Airport Shuttles

Three airport shuttles received DPFs, and an electrical regeneration facility was purchased and installed, as a SEP in an agreement signed by MDE and the Maryland Aviation Administration.

Total Cost: $50,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	0	1.3	1.4	7.5	10.2

Montgomery County Public School Bus Project

With a grant from US EPA, Montgomery County Public Schools had 86 school buses retrofitted with DPFs.

Total Cost: $699,901

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	0	3.33	7.25	36.15	90.89

Massachusetts

Waste Collection Vehicle Retrofit Program

MassDEP provided funding to retrofit 203 waste collection vehicles owned by municipal and private waste haulers with DOCs. Funding was provided by ARRA, DERA, and SEP settlement.

Total cost: $470,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	N/A	2.6	12.5	49.7	64.8

Massachusetts' state-owned onroad heavy-duty diesel vehicle fleet

MassDEP provided ARRA and SEP funding to retrofit 341 heavy-duty vehicles, including dump trucks, plow trucks, rack trucks, truck/crane combination vehicles, and front end loaders with DOCs. The vehicles are owned by the Massachusetts Department of Transportation and the Department of Conservation and Recreation. These vehicles are typically used for on-highway construction projects and/or snow plowing and other uses including movement of materials and personnel.

Total cost: $699,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	N/A	5.6	18.9	58.3	82.8

MassCleanDiesel 'Clean Air for Kids" Diesel School Bus Retrofit Program

Using $3.7 million in state and federal funding provided by the Massachusetts Department of Transportation (MassDOT), the MassCleanDiesel program installed pollution controls, DOCs and crankcase ventilation (CCV) systems, on 2,114 diesel-powered school buses that served nearly 310,000 students in 300 local communities.

Total cost: $3,700,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	N/A	10.8	41.4	184.2	236.4

MassCleanDiesel - State Fleet Retrofit Program - DPFs

Under the MassCleanDiesel: State Fleet Retrofit Program, MassDEP is using DERA funding to retrofit up to 25 MassDOT-owned diesel vehicles, namely John Deere series 544 and 644 wheeled loaders with US

EPA-verified DPFs. These vehicles are typically used for on-highway construction projects and/or roadway maintenance.

Total funding: $373,500

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	N/A	1	2	5.9	8.9

NESCAUM

Construction Equipment Retrofit Projects

Under two separate DERA-funded projects, construction equipment (loaders, excavators) were retrofitted with DPFs. One project involved five pieces of equipment based on construction sites in Massachusetts and New Hampshire. The other project involved 17 pieces of equipment, owned by rental companies and operating throughout Regions 1 and 2.

Total cost: $521,682

Lifetime Emission Reductions (tons)

Pollutant	HC	PM	CO	Total Reduction
Emission Reduction	11.36	3.25	44.70	59.31

Camden (NJ) Retrofit Project

Using SEP funds, 54 vehicles and equipment were retrofitted with DOCs and DPFs. The vehicles and equipment are from various publicly owned fleets in Camden County, NJ.

Total cost: $381,167

Lifetime Emission Reductions (tons)

Pollutant	HC	PM	CO	Total Reduction
Emission Reduction	2.29	5.2	4.71	12.20

New Jersey

South Jersey Port Retrofits

NESCAUM, in collaboration with NJDEP, repowered a wharf crane, two front end Loaders and two large lift trucks at the South Jersey Port Corporation in Camden, NJ. An additional four vehicles (3 lift trucks and a water truck) were retrofitted with DOCs. Emissions benefits each year are estimated to include 2.78 tons of PM and 17.1 tons of NO_X.

New Jersey Clean Construction

Using several sources of funding, NJDEP is retrofitting diesel vehicles used on state construction projects in urban, high population areas. To date, 253 DPFs have been installed on 192 pieces of construction equipment. Emissions benefits each year are estimated to be 5.0 tons per year, with additional retrofits ongoing.

Diesel Exhaust Reduction Plan

The Port Authority of New York and New Jersey, in collaboration with NJDEP, NYSDEC, and other stakeholders, developed a plan to reduce diesel exhaust, criteria pollutants and greenhouse gas

emissions from maritime operations at the port. The resulting Clean Air Strategy Plan's goal is to achieve a minimum 42% net reduction of criteria pollutants and 70% net reduction of local greenhouse gases over 14 years (or through 2020). Modeling of the port area indicates significant improvements in air quality will result from these measures. The measures include incentivizing ships to use cleaner fuel (already underway) and modernizing the drayage trucks that call on the port (already underway).

Mandatory Diesel Retrofit Program

Pursuant to a law passed in 2005, retrofits have been installed on 10,000 school buses, garbage trucks, transit buses and "public works" type vehicles, with an additional 6,000 expected before the program ends in 2016. When completed, these retrofits will result in about 130 tons per year of PM benefits.

South Jersey Port Corporation

NJ Clean Cities Coalition received a grant in 2011 to replace 21 engines on 8 marine vessels with Tier 2 engines. Repowered cargo handling equipment at South Jersey Port Corporation in Camden, NJ.

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	CO2
Emission Reduction	462	28.1	6.3	23	157.4

New York

Upstate Transit Buses Project

Using a $1,635,087 ARRA-DERA grant, NYSDEC managed a project to successfully retrofit 170 diesel powered transit buses. The purpose of the project was to reduce diesel emissions and improve air quality. The three upstate regional transportation authorities selected for funding under this project were: Central New York Regional Transportation Authority (CNYRTA), Rochester-Genesee Regional Transportation Authority (RGRTA), and the Niagara Frontier Transportation Authority (NFTA). Project funding was allocated to the three authorities based on the number of buses in their respective fleets that were required to be retrofitted and the financial resources available to each authority. There were 170 buses in total retrofitted with DPF, with 33 from CNYRTA, 36 from NFTA and 101 from RGRTA. The DPFs reduced diesel emissions of PM by 90%, HC by 85%, and CO by 75% from the selected transit buses.

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	0	12.51	27.018	351.08	390.77

NYS Clean School Bus Project

Using a $1,301,901 DERA FFY 2008 – 2012 grant, the NYSDEC in cooperation with the New York State Energy Research & Development Authority (NYSERDA) managed and completed a project which successfully installed 204 diesel retrofit devices and 373 direct fired heaters on school buses operating in NYS. The retrofits were a combination of after treatment devices including DPFs, DOCs and CCVs. The direct fired heaters provide emissions benefits through engine idle reduction. The purpose of the project was to reduce diesel emissions from school buses operating in NYS.

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	CO_2	Total Reduction
Emission Reduction	176.5	9.4	21.0	87.1	5874	6168

NYS Clean School Bus Project (DERA FFY 2013 grant)

NYSDEC in cooperation with NYSERDA is managing an on-going $157,562 DERA FFY 2013 grant. The grant is being used to continue the project to install direct fired heaters (DFHs) in school buses operating in NYS. It's estimated that the installation of approximately 77 DFHs will be funded through the grant. The grant work is to be completed by September 30, 2014. The estimated lifetime emissions reductions are noted below.

Lifetime Emissions Reductions (tons)

Pollutant	NO_X	PM	CO_2	Total Reduction
Emission Reduction	16.7	0.46	557	574.1

NYS Clean Diesel Grant Project (DERA FFY 2014 grant)

NYSDEC continues to have on-going discussions with US EPA regarding the grant process and is considering the submittal of a revised grant application to US EPA for the installation of idle reduction technologies for short-line railroad locomotives operating in NYS. The estimated DERA grant amount of $122,474 would be used to fund the installation of 5 APUs and 4 SCSs on a total of 9 locomotives. The estimated lifetime emissions reductions are noted below.

Lifetime Emissions Reductions (tons)

Pollutant	NO_X	PM	CO_2	Total Reduction
Emission Reduction	9.44	1.29	381	391.7

Virginia

Bus Retrofits and Fuel Conversions

Since 2005, more than 2,000 school and transit buses have been retrofitted with US EPA verified technologies to reduce hydrocarbon emissions, particulate emissions, CO emissions, and NO_X emissions. The table below provides a listing of such retrofits by jurisdiction and information on funding sources for the retrofits.

Jurisdiction	# of Buses	Control Retrofit	Funding Source
Fairfax County	345	ECM + DOC	Dominion Consent Decree SEP
	91	ECM + DOC	Local Funds Procurred
	576	ECM + DOC	Local Funds Procurred
Henrico County	100	ECM + DOC	Dominion Consent Decree SEP
Roanoke City	19	ECM + DOC	Dominion Consent Decree SEP
	117	DOC	Dominion Consent Decree SEP
Roanoke County	100	DOC	Dominion Consent Decree SEP
Virginia Beach	115	ECM + DOC	Dominion Consent Decree SEP
Norfolk	110	ECM + DOC	Dominion Consent Decree SEP
Frederick	127	DOC	Dominion Consent Decree SEP
Winchester	8	DOC	Dominion Consent Decree SEP
Loudoun	53	ECM + DOC	Dominion Consent Decree SEP
Rockingham	141	DOC	Merck Consent Decree SEP
Harrisonburg	23	DOC	Merck Consent Decree SEP
Harrisonburg - Transit Buses	13	DOC	Merck Consent Decree SEP
Alexandria	33	DOC	Dominion Consent Decree SEP
Gloucester	40	DOC	Dominion Consent Decree SEP

Richmond City	195	DOC	Clean School Bus USA Grant
Arlington	22	DOC + CCV	Dominion Consent Decree SEP
Hopewell	28	DOC	Clean School Bus USA Grant
Stafford	87	DOC	Dominion Consent Decree SEP

Additionally, the Greater Richmond Transit Commission (GRTC) is converting its fixed route buses and paratransit vehicles to CNG. In 2013, 8 buses and 15 vans were converted to CNG, and 21 buses and 15 vans are planned for 2014. The entire fleet of 155 buses will be converted in the next several years, reducing NO_X emissions from these vehicles by more than 80%, reducing GHG emissions by 20%, and resulting in fuel cost savings of $50,000 annually.

Vermont

School Bus Retrofits

Using Clean School Bus USA grant funds in conjunction with State funds and in-kind staff resources and expertise to facilitate the program, the Vermont Department of Environmental Conservation (DEC) retrofitted 15 school buses with DOCs and CCV systems and equipped 25 buses with programmable diesel-fired coolant heater technology. Through this project, emissions from buses equipped with emissions control retrofit devices and idle-reduction technology were significantly reduced, childhood exposure to unhealthful contaminants was reduced, and the effectiveness of these technologies was demonstrated to a broad audience of school bus administrators and interested parties throughout the state. The idle reduction technology will also result in an estimated savings of 59,762 gallons of diesel fuel over the remaining life of the buses.

Total cost: $200,904

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	CO_2	Total reduction
Emission Reduction	20.0	0.7	0.5	1.2	663.4	685.8

Vehicle Replacements/Purchases

Connecticut

Recycling Truck Replacement

Using State DERA and municipal funds, DEEP replaced four standard recycling trucks owned by the Town of Enfield, with two larger, fully automated, recycling trucks. The automated systems reduce idling time, allowing the two new trucks to cover all the routes previously served by four trucks. Air quality benefits accrue from improved emissions standards, from the decreased number of trucks and from reducing the amount of idling.

Total cost: $587,938

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	85.19	4.26	3.95	22.66	116.06

Two DERA-Funded Municipal Maintenance Truck Replacement Projects

Using State DERA and municipal funds, DEEP replaced two maintenance trucks in Middlebury with new

trucks that utilize auto-shut-off technology to reduce idling, saving fuel and decreasing emissions. An additional municipal maintenance truck replacement project is underway in Wethersfield using State DERA2 and municipal funds.

Total cost: $332,995

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	29.22	1.99	2.39	10.62	44.22

Seven SEP-Funded Municipal Truck Replacements

Deep used $360,000 in SEP funds toward early replacement of diesel-powered trucks for the following seven municipalities: Enfield, Middletown, Naugatuck, Plainville, Stamford, Waterbury and Wethersfield. Noteworthy among these was Stamford's project which added hydraulic hybrid assist technology to its new refuse collection truck.

Total cost: $1,491,193

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	17.31	0.72	0.78	5.10	23.91

Shuttle Bus Replacement

Using State DERA and university funds, DEEP replaced one shuttle bus for the University of Hartford.

Total cost: $143,512

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	1.14	0.09	0.15	See note*	1.38

*While there is an annual reduction of CO, the lifetime emissions appeared to increase due to the fact that the lifetime of the old bus is 12 years, while the new bus's projected lifetime is 29 years.

CNG Replacement Project

Using State DERA funds and a significant contribution from the owner, Enviro Express, LLC, DEEP replaced a diesel-powered roll-off truck with a CNG-powered roll-off truck .

Total cost: $165,077

Lifetime Emission Reductions (tons):

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	0.77	0.09	0.11	0.75	1.72

Refrigerated Box Truck Replacement

The Connecticut Department of Corrections augmented its state budget with State DERA2 funds from DEEP to replace a refrigerated box truck used to deliver food to its facilities across the state. The new truck has a larger capacity, which will reduce VMT and a state-of-the-art refrigeration unit, the added efficiency of which will provide further emission reductions.

Total cost: $149,392

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	1.40	0.05	0.11	0.55	2.01

Diesel Equipment Replacement - Fort Delaware

Two diesel reciprocating piston generators were replaced with a microturbine diesel generator. The microturbine generator will provide electricity to the Fort Delaware State Park on Pea Patch Island.

Total cost: $160,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	Total Reduction
Emission Reduction	1,112	5	1,117

Drayage Truck Replacement

The first project provided a partial purchase of newer cleaner burning drayage trucks. The drayage truck replacement program is already in operation in several states in the mid-Atlantic region and has been successfully managed by the Mid-Atlantic Regional Air Management Association (MARAMA) who subcontracts part of the work to the University of Maryland Environmental Finance Center (EFC).

Total Cost: $113,066

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total reduction
Emission Reduction	0.7	0.039	0.0273	0.1952	0.9615

MARAMA

Alexandria VA DASH Transit Bus Replacements

Supported by an ARRA sub-award from MARAMA, Alexandria Transit Company replaced seven model-year 1996 – 1998 transit diesel buses with hybrid electric transit buses.

Total cost: $3,652,621 ($913,155 grant funded)

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	28.61	1.33	1.72	12.23	186.61

Chaney Enterprises Cement Truck Replacements (Maryland)

Chaney Enterprises used an ARRA grant from MARAMA to prematurely retire from service seven heavy duty cement trucks, model years 1997 – 1999, with essentially no emission reduction equipment, and replaced them with new, clean more fuel efficient 2010 vehicles.

Total cost: $1,327,696 ($306,465 grant funded)

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	124.39	3.91	4.44	31.42	164.16

MDE DERA Dray Truck Replacements

With a State DERA fund sub-award, MARAMA worked with the Maryland Department of the Environment to replace 10 drayage trucks serving Baltimore ports at a cost of $20,000 per truck.

Total cost: $546,940 ($200,000 grant funded)

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	140.95	6.37	5.02	34.27	186.61

Federal Transit Administration Capital Investment Program

Utilizing a grant from the USDOT's Federal Transit Administration Capital Investment Program, the Baltimore Regional Transportation Board worked with MDE to purchase three additional diesel hybrid transit buses for Howard County.

Total Cost: $594,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	27.6	0.45	0.96	0	29.01

Massachusetts

Northeast Hybrid Truck Consortium Hybrid Truck Purchasing Program

MassDEP used ARRA, DERA, and SEP funding to offset the incremental cost (up to 25% or $40,000) of purchasing 11 diesel medium- and/or heavy-duty hybrid trucks for commercial fleets and utility fleets as replacements for the conventional diesel-powered trucks.

Total cost: $440,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	CO_2	Total Reduction
Emission Reduction	10.1	0.4	1.4	5.5	1,941	1,958.4

NESCAUM

Northeast Hybrid Truck Consortium Hybrid Truck Purchasing Program

Under a subcontract with the Environmental Defense Fund, NESCAUM managed this project to provide 25 percent subsidies to various fleets in Connecticut, Maine, New Hampshire, and Rhode Island towards the purchase of 11 new heavy-duty hybrid trucks. The subsidies were made available through a DERA grant. In exchange, fleet owners retired an older conventional diesel truck for each hybrid purchased.

Total cost: $1,464,915

Annual Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO_2	Total Reduction

Emission Reduction	2.28	0.08	0.13	84.20	86.69

New Hampshire

Compressed Natural Gas Refuse Trucks

The City of Nashua, NH was provided with $411,000 in DERA funds to help purchase nine CNG refuse trucks. The new trucks replaced older diesel vehicles from model years 1991 through 2005. Funds covered the cost of converting functionally equivalent diesel vehicles to run on CNG. The investment in CNG vehicles leveraged considerable private sector investment in CNG fueling infrastructure in Nashua. The City has since purchased several more CNG vehicles using funds provided by CMAQ through the Granite State Clean Cities Coalition. Nashua's new CNG fueling station is open to the public, enabling other local businesses to convert to CNG.

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	CO	Total Reduction
Emission Reduction	22	0.4	1.8	24.2

Marine Engine Replacements

Also using ARRA funds, four boats including two fishing and two excursion vessels were provided with $239,200 to help fund the early replacement of their six engines.

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	CO_2	Total Reduction
Emission Reduction	61	1.4	6.4	69.4

Diesel Trucks Replacements

In 2013, DES provided $50,000 in DERA funding to help Clarke Distributors replace five older panel trucks with new, more efficient trucks. These vehicles travel over 20,000 miles per year within an area of the state that experiences air quality alert days because of particulates and ozone. This grant leveraged over $200,000 in matching funds Clark used to purchase the vehicles that meet US EPA 2012 emissions standards and emit 99% less particulate matter than the vehicles they replaced.

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	CO	Total Reduction
Emission Reduction	38.8	1.8	11.2	51.8

Other Projects

Maine

Active Transportation

According to U.S. Census Bureau, 2008-2012 American Community Survey over 4 percent of Maine workers walk to work and over 0.5 percent bicycle. This level of active transportation is notable in light of Maine's large geographical area and low population density.

The Kittery Memorial Bridge is a model for Active Community Environment projects and is part of the East Coast Greenway system, connecting Maine to Florida.

Construction began on the final phase of the paved Lisbon Bicycle and Pedestrian Trail connecting the municipalities and downtown areas of Lisbon and Lisbon Falls.

Maryland

Idle Reduction Campaign

ARRA funds, were used for a heavy-duty vehicle anti-idling (coach buses & trucks) outreach campaign in the state. The Metropolitan Washington Council of Governments (COG), Maryland Department of the Environment (MDE), District Department of the Environment (DDOE) and the District Department of Transportation (DDOT) formed a Steering Committee to develop and manage the Project. The campaign targeted trucking and bus companies, related trade associations and business groups. The campaign was implemented by a marketing consultant using a multi-jurisdictional approach.

Total cost: $150,000

Driver Recognition Program

Using State DERA funds, the Driver Recognition Program was initiated as part of a broader Diesel Idle Reduction campaign which aimed to elevate awareness of the financial and environmental benefits of diesel idle reduction, and encourage compliance with idling regulations. The Driver Recognition Program engaged frontline personnel who ultimately make the decision to let their vehicles run or turn off their engines. The program acknowledged and rewarded those who comply with diesel idle reduction laws and set a good example for other drivers.

Total cost: $20,145

MPA International Marine Emissions Reduction Study

Using DERA funds, MDE partnered with Maryland Environmental Service and the Maryland Port Administration to develop a study with two specific tasks. Task 1 would identify candidate technologies that would reduce emissions from ocean going vessels at the Port. Task 2 would evaluate the list of technical and operational options for reducing emissions developed under Task 1 and evaluate them for applicability at the Port of Baltimore.

Total cost: $75,000

Clever Devices Bus Idling Reduction

Clever Device BusLink devices, which allow remote starting for warmup, were installed on 64 Maryland Transit Administration (MTA) transit buses to reduce bus idling at Baltimore City bus depots under a $65,000 grant from U.S. Department of Energy's Clean Cities Grant. After the trial period, MTA installed devices on an additional 295 buses at a cost of $295,000. It had been estimated that MTA's full fleet of 822 diesel buses idled more than 2,250,000 hours annually, consuming over 2,800,000 gallons of fuel.

Total Cost: $360,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	Total Reduction
Emission Reduction	92.1	1.08	29.94	356.87	479.99

Massachusetts

MassCleanDiesel: Clean Market Program

MassDEP is using DERA and SEP funds to provide retrofit technologies, idle reduction technologies and replacement of diesel transportation refrigeration unit (TRU) with electric units at markets, distribution facilities, and warehousing centers. The target fleets include 85 publicly or privately owned on-road and non-road vehicles, and stationary equipment.

Total cost: $1,215,000

Lifetime Emission Reductions (tons)

Pollutant	NO_X	PM	HC	CO	CO_2	Total Reduction
Emission Reduction	347.5	47.7	58	225.5	18,139	18,817.8

New Jersey

New York/New Jersey Harbor Deepening Project

The NY/NJ Harbor Deepening Project is an 11 year (2005 - 2015) dredging project that will deepen several channels in the Port to a depth of approximately 50 feet below mean sea level. The channels include: Ambrose, Anchorage, Kill Van Kull, Newark Bay, Arthur Kill, Bay Ridge and Port Jersey. In order for the project to meet the requirements of the Federal General Conformity regulation, a mitigation plan to reduce the annual NO_X emissions to zero was required. The Port Authority of New York/New Jersey, Army Corps of Engineers, US EPA, New Jersey Department of Environmental Protection ("NJDEP"), New Jersey Department of Transportation's Office of Maritime Resources, New York State Department of Environmental Conservation ("NYSDEC") and the New York City Department of Transportation collaborated to develop the Harbor Air Management Plan. Since the beginning of the project, the strategies in the Harbor Air Management Plan have been utilized to mitigate approximately 3,500 tons of NO_X.

OBD Fraud Investigation

Beginning in the year 2012 and continuing throughout the year 2013, the NJDEP and the NJ Motor Vehicle Commission worked on a joint investigation with the Attorney General's Office Division of Criminal Justice on a case of OBD fraud. As a result of this collaborative effort, three men who operate a private auto inspection business in Paterson, New Jersey were charged on January 15, 2014 with fraudulently using data simulators to generate false results for motor vehicle emissions inspections. The men allegedly took payments from customers in return for using the electronic devices to generate passing results for vehicles that had failed emissions inspections. Details of the investigation and resulting charges can be found in a Press Release on the Attorney General's Website at http://nj.gov/oag/newsreleases14/pr20140115a.html.

The Harbor Air Mitigation Plan

Strategies include:

The installation of Selective Catalytic Reduction technology on two Staten Island ferries
The installation of Tier 1 kits on 3 Staten Island ferries and the installation of Tier II kits on 3 Staten Island ferries
Main and/or auxiliary engines replaced on 20 marine vessels in the Marine Vessel Engine Replacement Program I and II (MVERP I and II)
Main engines replaced on 3 tugs for Port Jersey's Tug Engine Vessel Replacement Program
Main/auxiliary engines replaced on 2 tugs for Kill Van Kull channel

Virginia

On-Road Emissions Testing Program Expansion

As part of VDEQ's decentralized I/M program for the identification and repair of high emitting vehicles, VDEQ operates an On-Road Emissions (ORE) testing program using remote sensing of vehicle emissions. In the ORE program, on-road remote sensing devices identify vehicles with high emissions, and owners of these vehicles must make necessary repairs. This real-time monitoring and identification effort allows out-of-cycle identification of high emitting vehicles so that repairs happen sooner. Additionally, the ORE program can detect vehicles with very high evaporative emissions, possibly coming from leaking fuel tanks or lines. VDEQ notifies owners of such vehicles that they may have a gasoline leak, which could be a potential safety issue and may reduce fuel economy. For exceptionally clean vehicles observed by remote sensing, the ORE program provides owners an emission inspection pass. The 2012 Virginia General Assembly passed legislation expanding this program, and this expansion will be beneficial for both the citizens and the environment. More remote sensing operations will mean more high emitting vehicles identified prior to their biennial station-based emissions test as well as more citizens with exceptionally clean vehicles receiving emission inspection passes. The expansion of the program is scheduled to begin in the fall of 2014.

64 Express

Beginning in late 2008, a container-on-barge service began operating between the Port of Richmond and the Virginia Port Authority (VPA) terminals in Hampton Roads. This service, called the 64 Express, started as a partnership between the VPA, the Richmond Area Metropolitan Planning Organization, and the Hampton Roads Transportation Planning Organization. Initially, the program was funded via a grant from the U.S. Maritime Administration's America's Marine Highway Program, funds from the CMAQ program, and other state and local funding sources. This service provides an alternative to trucking imports bound for regional distribution or export from the region to international markets. The service mitigates highway system impacts associated with goods movement by shifting individual containers from truck to barge. Each barge transit reduces congestion, reduces maintenance and operations-related highway system costs, and on a per-ton-mile basis produces fewer VOC or NO_X emissions than either rail or truck alternatives. A fully loaded barge has the capacity to carry up to 100 containers, as shown in the picture below.

64 Express Barge Operations

During the first year of operation, the barge transported approximately 6,000 containers, removing 12,000 truck trips from the I-64 corridor. Since then, additional barges and weekly trips have been added to the route as demand has increased. According to the VPA, in 2011 4% of the port's cargo was moved by barges, which is equivalent to 28,800 trucks per year or 79 trucks per day on regional roadways. A VPA study estimates that the 64 Express will remove about 285 trucks per day from this corridor in 2040. Estimates indicate that the program is responsible for 11,200 kilograms/day (kg/day) of VOC reductions and 3,563 kg/day of NO_X reductions, roughly 4,400 tpy of VOC and 1,400 tpy of NO_X. As the program expands, these benefits will continue to increase. This program will also improve the quality of life for all citizens using

the I-64 corridor by reducing truck traffic congestion. More information may be found at http://www.64express.com/. Emissions estimates may be found at https://fhwaapps.fhwa.dot.gov/cmaq_pub/HomePage/ using case number VA20090013.

Inter-Terminal Barge Service

The Hampton Roads Transportation Planning Organization has allocated a total of $8,190,480 in CMAQ funds between fiscal year 2012 and fiscal year 2015 to a VPA project for the Inter-Terminal Barge Service. This project will provide a container-on-barge intra-harbor terminal service to shuttle containers between NIT and PMT and includes requirements to use ultra low sulfur diesel (ULSD). The project is expected to reduce emissions and traffic congestion, while also improving safety.