



# DERA Fourth Report to Congress: Highlights of the Diesel Emissions Reduction Program

# Acronyms and Abbreviations

ARRA	American Recovery and Reinvestment Act of 2009
CO <sub>2</sub>	Carbon Dioxide
DERA	Diesel Emissions Reduction Act
DOC	Diesel Oxidation Catalyst
DPF	Diesel Particulate Filter
EPA	Environmental Protection Agency
FY	Fiscal Year
HC	Hydrocarbon
NO <sub>x</sub>	Nitrogen Oxides
PM	Particulate Matter
RFP	Request for Proposals

## Photo Credits

All photos in this report are by DERA funding recipients, EPA staff managing DERA awards, or EPA Chief Photographer Eric Vance unless otherwise noted. The cover photo of a school bus is by Tracey Footer.

## Disclaimer of Endorsement

Mention of or referral to commercial products or services, and/or links to non-EPA sites does not imply official EPA endorsement of or responsibility for the opinions, ideas, data, or products presented at those locations, or guarantee the validity of the information provided.

# Table of Contents

Executive Summary.....	1
DERA Funding Benefits .....	1
Project Locations, Sectors, and Technologies Since 2008 .....	4
2017 and Beyond.....	5
Section 1: DERA National Competitive Grants .....	8
Fiscal Year 2014 – National Grants .....	8
Fiscal Year 2015 – National Grants .....	9
Fiscal Year 2016 – National Grants .....	10
Moving Forward – National Grants .....	11
DERA Tribal Grants .....	13
Moving Forward – Tribal Grants .....	14
Section 2: DERA State Program .....	15
FY 2014-2016 State Grants.....	15
Moving Forward – State Grants .....	17
Section 3: DERA School Bus Rebate Program .....	18
The 2014-2016 School Bus Rebate Program .....	18
Moving Forward - Rebates.....	20
Section 4: DERA Funding at Ports.....	21
Moving Forward - Ports .....	21
Lessons Learned for the DERA Program .....	23
Looking Ahead for the DERA Program .....	24
Appendix A: List of DERA Projects.....	26

## Table of Exhibits

Exhibit 1: DERA Program Benefits and Accomplishments (FYs 2008-2016)	1
Exhibit 2: DERA Funded Sectors 2008-2016 .....	4
Exhibit 3: DERA Funding by Technology Type, 2008-2016 .....	4
Exhibit 4: Map of DERA Awards .....	5
Exhibit 5: Diesel Exhaust Health Effects .....	6
Exhibit 6: DERA Funding Appropriations, 2014-2016 .....	8
Exhibit 7: FY 2014 DERA Funding by Sector .....	8
Exhibit 8: FY 2014 DERA Technologies .....	9
Exhibit 9: FY 2015 DERA Funding by Sector .....	9
Exhibit 10: FY 2015 DERA Technologies .....	10
Exhibit 11: FY 2016 DERA Funding by Sector .....	10
Exhibit 12: FY 2016 DERA Technologies .....	11
Exhibit 13: Reducing Emissions on School Buses through Retrofits .....	12
Exhibit 14: FY 2014-2016 DERA Tribal Funding by Sector .....	13
Exhibit 15: FY 2014-2016 DERA Tribal Technologies .....	13
Exhibit 16: FY 2014-2016 DERA State Funding by Sector .....	16
Exhibit 17: FY 2014-2016 DERA State Technologies .....	16
Exhibit 18: School Bus Rebate Funds Awarded and Requested .....	19

# Executive Summary

From transportation to power generation, the diesel engine is in every part of the U.S. economy. Invented in the 1890s, it is durable and strong. And thanks to American ingenuity, new engines coming off the manufacturing line are now sixty times cleaner than prior to EPA's emissions standards. However, nearly 10 million older diesel engines are still in use in communities across the United States, emitting diesel exhaust which can harm human health and the environment.

The [Diesel Emissions Reduction Act \(DERA\)](#) program, authorized in 2005 and reauthorized with unanimous bipartisan support in 2010, is the only Federal government program addressing legacy engines<sup>1</sup> as its sole mission. Cost-effective, targeted to disproportionately affected communities, and supported by American industry, the DERA program continues to evolve with market and stakeholder demands.

EPA's National Clean Diesel Campaign (NCDC) within the [Office of Transportation and Air Quality](#) administers the DERA grant and rebate programs. EPA awarded the first DERA grants in 2008, the American Recovery and Reinvestment Act (Recovery Act) grants in 2009, and grants from funds appropriated in Fiscal Years (FY) 2009 through 2018. This Fourth Report to Congress summarizes final results from FY 2008-2013 and details a combination of final and estimated results from FY 2014-2016.

## DERA Funding Benefits

Since 2008, the DERA program has achieved impressive outcomes and a range of benefits, summarized in Exhibit 1.

### Exhibit 1: DERA Program Benefits and Accomplishments (FYs 2008-2016)

Investment of DERA Program	Emission and Fuel Reductions
\$629 million funds awarded	472,700 tons of NO <sub>x</sub>
67,300 engines retrofitted or replaced	15,490 tons of PM
Up to \$19 billion in monetized health benefits	17,700 tons of hydrocarbon
Up to 2,300 fewer premature deaths	61,550 tons of carbon monoxide
64% of projects targeted to areas with air quality challenges	5,089,170 tons of carbon dioxide
3:1 leveraging of funds from non-federal sources	454 million gallons of fuel saved



### Improved air quality and public health

DERA grants have funded projects that provided immediate health and environmental benefits. From fiscal years 2008 to 2016, EPA awarded \$629 million to retrofit or replace 67,300 engines in vehicles, vessels, locomotives or other pieces of equipment, with \$300 million of this funding coming from the Recovery Act alone. EPA estimates that these projects will reduce emissions by 472,700 tons of NO<sub>x</sub> and 15,490 tons of PM<sub>2.5</sub><sup>2</sup> over the lifetime of the affected engines. Because of these pollution reductions, EPA estimates a total present value of up to \$19 billion in monetized health benefits over the lifetime of the affected engines, which include up to 2,300 fewer premature deaths associated with the emission reductions achieved over this same period.<sup>3,4</sup> These clean diesel projects awarded from FY 2008 to 2016 are also estimated to reduce 17,700 tons of hydrocarbon (HC)<sup>5</sup> and 61,550 tons of carbon monoxide (CO) over the lifetime of the affected engines.

### Served disproportionately impacted communities

Many DERA projects have made health and environmental impacts in socially and economically vulnerable areas. Goods movement projects are especially beneficial because they tend to take place in communities that are disproportionately impacted by higher levels of diesel exhaust, such as those near ports, rail yards, and distribution centers. Clean diesel projects reduce exposure for people living in these communities, and the improved air quality provides immediate health benefits. Since the first DERA grants in 2008, EPA has focused attention on PM and ozone nonattainment areas and areas with elevated air toxic exposure, to achieve maximum benefits for every dollar spent. For projects awarded in FY 2008 to FY 2016, 64% were in areas with these air quality challenges.

### Reduced climate impacts and improved fuel savings

DERA projects awarded in FY 2008 to FY 2016 are estimated to reduce 5,089,173 tons of carbon dioxide (CO<sub>2</sub>) over the lifetime of the affected engines and save over 454 million gallons of fuel because of idle reduction and fuel-efficient technologies. [Black carbon \(BC\)](#), a component of PM, contributes to adverse health impacts associated with PM exposure. Particles emitted by legacy mobile diesel engines are about 75% BC, so reductions in these BC-rich sources are also likely providing climate benefits. DERA projects provide immediate BC reductions by reducing PM emissions from the legacy fleet of diesel engines, and have reduced a total of 15,490 tons of PM over the lifetime of the projects covered in this report.

### Focused on ports and other parts of the supply chain

Moving goods through the supply chain requires many trucks, trains, ships, cargo handling equipment, barges, and workboats. Addressing the harmful emissions from these operations is an ongoing and increasing priority for local, state, national and international policy policymakers. To help address these issues, DERA funding is often targeted at intermodal hubs, such as ports and

delivery centers, and across the nation's transportation infrastructure. In doing so, we are modernizing the diesel-powered equipment that moves our economy by transporting goods throughout the nation. EPA anticipates that DERA will continue to prioritize diesel emission reductions at ports and other freight distribution centers to complement the work being done by the port industry, communities, and all levels of government to improve environmental performance and increase economic prosperity.

#### Generated economic and environmental activity

Clean diesel projects are cost-effective according to EPA's calculations of health benefits. Each federal dollar invested in clean diesel projects has leveraged as much as \$3 from other government agencies, private organizations, industries, and nonprofit organizations, generating between \$11 and \$30 in public health benefits.<sup>6</sup> Each federal dollar invested in DERA also results in over \$2 in fuel savings.<sup>7</sup> DERA funding has accelerated upgrades and replacements for old diesel vehicles and equipment, improving the public and private diesel fleets that are critical to the economy.

#### Answered popular demand

Stakeholders have shown a tremendous amount of interest in EPA-funded clean diesel projects. Funding request amounts have exceeded funding availability by as much as 38:1 for our National Clean Diesel Rebate Program and 7:1 for our national grant competitions since the inception of DERA. These requests highlight the interest in the DERA program to meet the nation's need for diesel emission reductions and fleet turnover incentives.

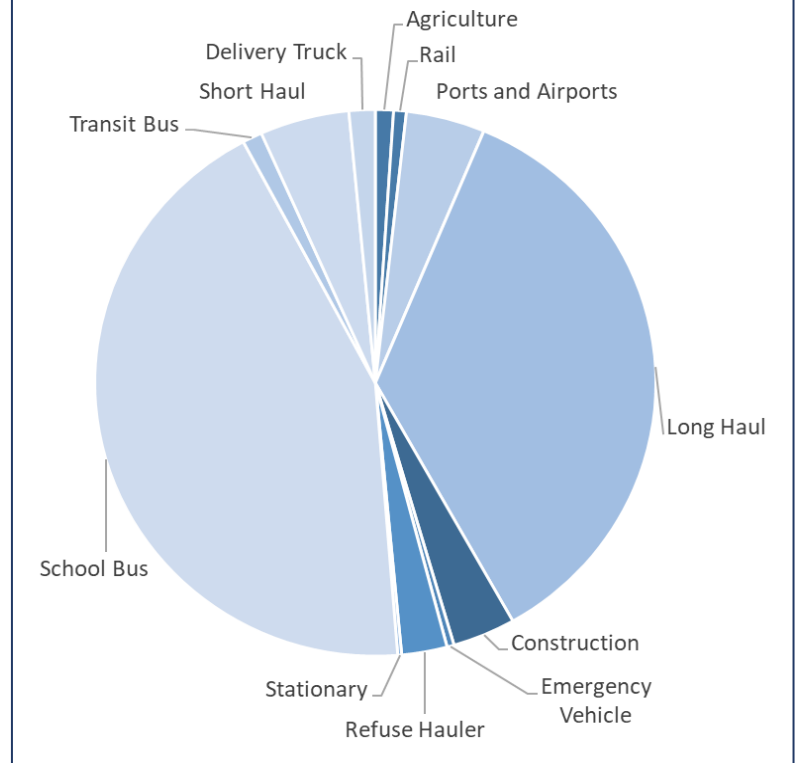
#### Met local needs

EPA is committed to engaging local communities through clean diesel projects, and targets projects that will be able to continue to provide benefits after the project period has closed. These grants have addressed local environmental and public health problems as DERA grant recipients tailor projects to the needs of each individual community.

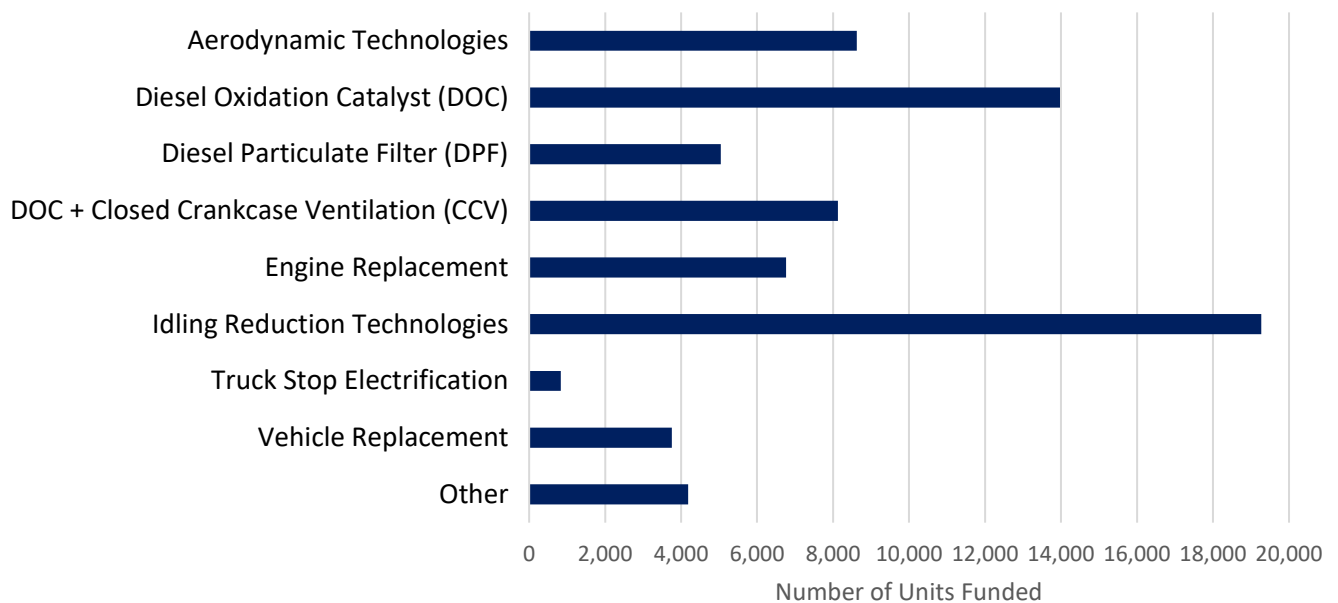
## Project Locations, Sectors, and Technologies Since 2008

In the early years of DERA, many applicants requested funding for retrofits of on-highway vehicles, especially long-haul trucks and school buses. As the DERA program progressed and EPA's on-highway 2007 standards were implemented, applicants sought to replace larger vehicles, vessels and equipment in ports and rail yards. Exhibit 2 shows the most frequently funded sectors for FY 2008-2016. Exhibit 3 shows the most frequently funded technologies for FY 2008-2016.<sup>8</sup>

**Exhibit 2: DERA Funded Sectors 2008-2016**



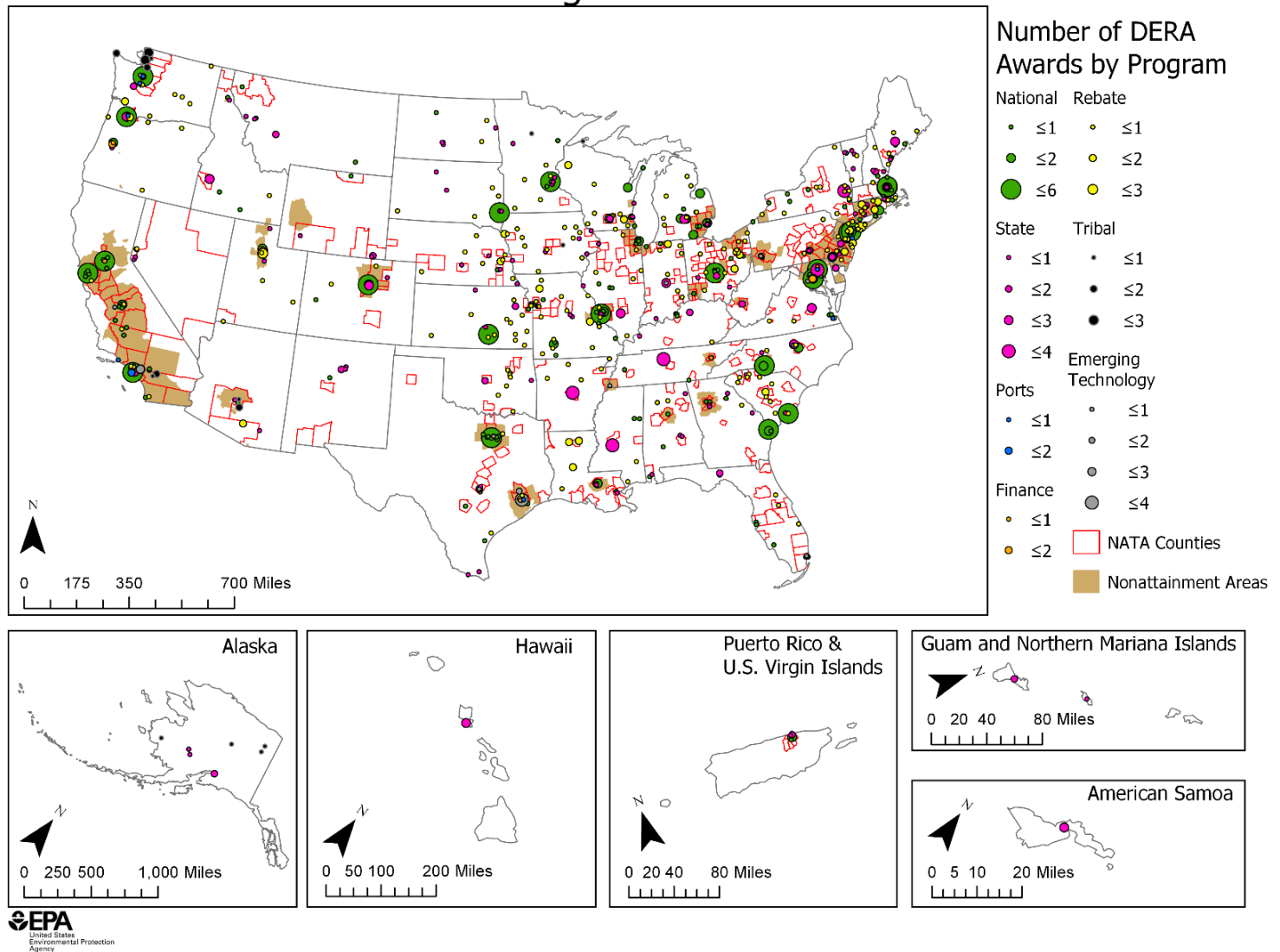
**Exhibit 3: DERA Funding by Technology Type, 2008-2016**





## Exhibit 4: Map of DERA Awards

## DERA Program FY 2008-2016



## 2017 and Beyond

EPA has awarded funding for FY 2017 and FY 2018 grants and rebates and will cover these projects in the next Report to Congress when the projects are finalized or close to completion. EPA will continue to target its funding to areas that suffer from poor air quality. EPA is especially interested in working with port communities, and the national RFP prioritizes projects that reduce emissions from engines involved in goods movement and freight industries. EPA also prioritizes projects that engage local communities and provide lasting benefits. Based on the size of the legacy fleet and past demand for rebate funding exceeding availability, with \$5 in requests for every \$1 available; subject to available appropriations, EPA plans to continue to offer rebate funding to

Fourth Report to Congress: Highlights from the Diesel Emissions Reduction Program encourage fleet turnover for engines that pre-date EPA's on-highway standards for PM (engine model year 2006 or older).

## Exhibit 5: Diesel Exhaust Health Effects

Direct emissions from diesel engines, especially PM, NO<sub>x</sub>, and sulfur oxides (SO<sub>x</sub>), as well as other air toxics, contribute to health problems. In addition, NO<sub>x</sub> contributes to the formation of ozone and PM through chemical reactions.

PM has been associated with an increased risk of premature mortality, increased hospital admissions for heart and lung disease, and increased respiratory symptoms. Long-term exposure to components of diesel exhaust, including diesel PM and diesel exhaust organic gases, are likely to pose a lung cancer hazard. Exposure to ozone can aggravate asthma and other respiratory symptoms, resulting in more asthma attacks, additional medication, lost school and work days, increased emergency room visits and hospitalizations, and even premature mortality. Repeated exposure to ozone can increase susceptibility to respiratory infection and lung inflammation and can aggravate preexisting asthma. At sufficient concentrations, ozone can even cause permanent damage to the lungs, resulting in the development of chronic respiratory illnesses. Children, outdoor workers, those who exercise outside, people with heart and lung disease, and the elderly are most at risk.

The technologies used in DERA grants can reduce PM emissions by up to 95% and NO<sub>x</sub> by up to 90%. Each of these reductions makes an immediate and positive impact on public health. PM and NO<sub>x</sub> controls have been the primary focus for the time period of this Report.



For more information on health effects, see [Health Assessment Document for Diesel Engine Exhaust](#), which examines information regarding the health hazards associated with exposure to diesel engine exhaust.

---

<sup>1</sup> “Legacy engines” are defined by the DERA program as the operating nonroad diesel and medium to heavy-duty highway diesel engines with engine model years 2006 and earlier. Most newer engines are required to meet stricter emission standards.

<sup>2</sup> PM2.5 will be referred to as PM for the rest of this Report.

<sup>3</sup> When a grant is awarded, estimated emissions reductions are calculated. As the grant progresses, DERA grant recipients are required to submit quarterly programmatic progress reports to EPA. Once a grant is completed, the recipient submits a final programmatic report which includes an overview of the project's implementation and a final accounting of project expenses and results. EPA evaluates the reports for consistency and accuracy.

EPA estimates emissions reductions for each project through our web-based [Diesel Emissions Quantifier \(DEQ\)](#) using the information in the final grant reports. The DEQ relies on EPA emission models like MOVES2014a as well as documents like regulatory impact analyses for its calculations. After the emissions reductions are calculated, the information is tracked internally along with all grant recipient information. Final emissions data for each grant is totaled for each fiscal year and program.

EPA estimates that the total lifetime value of health benefits from the emission reductions associated with FY 2008 through FY 2016 DERA awards range from \$7.0 billion to \$19 billion (in 2017 dollars; range reflects the use of both a 3 and 7 percent discount rate and the valuation of premature mortality derived from either the American Cancer Society cohort study (Krewski et al., 2009) or the Harvard Six-Cities study (Lepeule et al., 2012)). Benefits were calculated using [EPA's PM2.5 benefit per ton values](#), which monetize a suite of PM-related health impacts including premature mortality, hospital admissions, emergency room visits, and work loss days.

<sup>4</sup> EPA estimates that the emission reductions achieved over the lifetime of the affected engines will help avoid between 1,000 and 2,300 premature deaths. Estimates of premature mortality avoided were calculated using PM-related incidence per ton estimates presented in the benefit per ton Technical Support Document (referenced above). The range of premature mortality avoided is derived from either the American Cancer Society cohort study (Krewski et al., 2009) or the Harvard Six-Cities study (Lepeule et al., 2012).

<sup>5</sup> In the prior DERA Third Report to Congress, the hydrocarbon reduction in the executive summary was estimated to be 18,900 tons. EPA now considers this prior figure to be an overestimation. The current figure of 17,700 tons is based on more accurate emission reduction calculations.

<sup>6</sup> The EPA technical support document estimating benefits per ton was updated with new values in 2018 and can be found here: [www.epa.gov/sites/production/files/2018-02/documents/sourceapportionmentbpttsd\\_2018.pdf](http://www.epa.gov/sites/production/files/2018-02/documents/sourceapportionmentbpttsd_2018.pdf) (accessed 6/12/2019).

<sup>7</sup> Fuel cost savings are based on the total diesel gallons reduced in DERA projects and the average price of diesel between 2008 and 2016. Fuel savings in DERA projects are largely a result of idle-reduction technologies.

<sup>8</sup> Many grant recipients installed more than one technology on each vehicle, so the total number of technologies exceeds the 67,300 vehicles affected figure stated above.

## Section 1: DERA National Competitive Grants

EPA prioritizes clean diesel projects that provide immediate health and environmental benefits and target areas of greatest need. The [DERA legislation](#) emphasizes maximizing health benefits, serving areas of poor air quality, such as non-attainment areas for PM and ozone, and conserving diesel fuel.

Each fiscal year, by statute, EPA sets aside 30% of funding for states to establish their own clean diesel programs. The remaining 70% of the annual appropriation is used for national competitive grant and rebate funding opportunities. Some of those funds may be reserved for special funding opportunities, such as the School Bus Rebate Program, but most are directed to a [nationwide, competitive grant program](#).

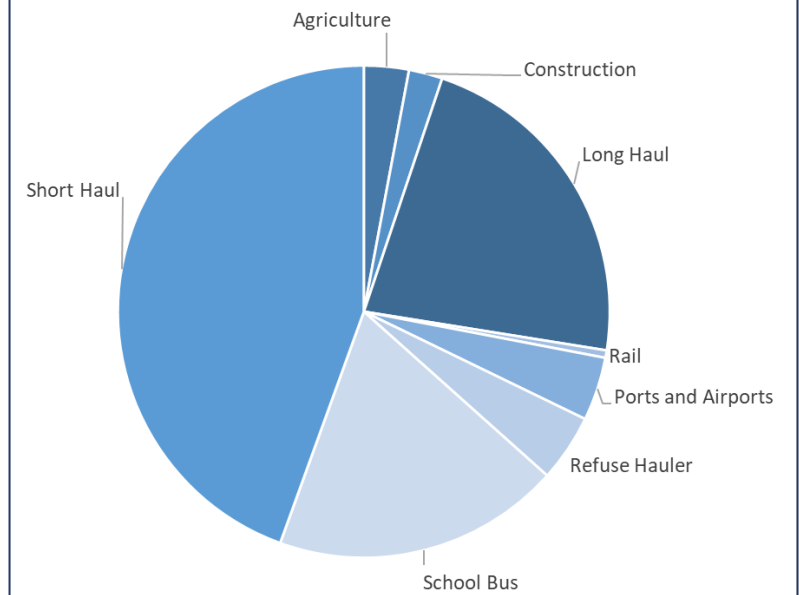
### Exhibit 6: DERA Funding Appropriations, 2014-2016

2014	2015	2016
\$20 million	\$29.8 million	\$49.5 million

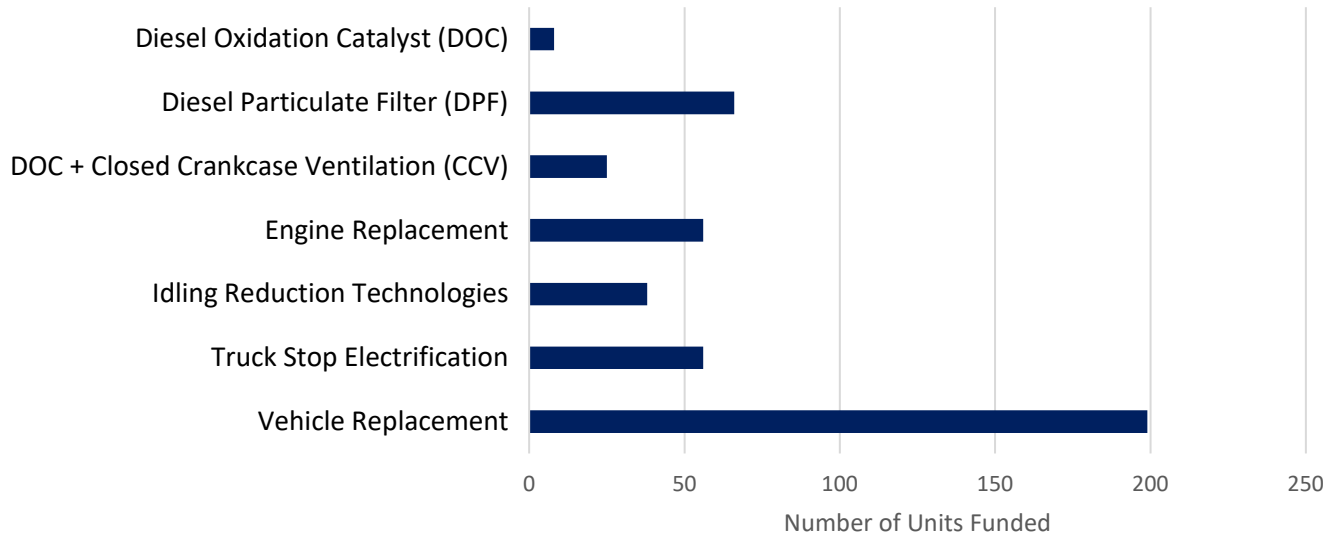
### Fiscal Year 2014 – National Grants

EPA received a \$20 million appropriation for DERA in FY 2014. EPA funded 21 national competitive grants across the country for a total of \$10.6 million. EPA received 50 applications requesting \$32 million. See Exhibit 7 and Exhibit 8 for project details. Over the lifetime of the affected engines, DERA FY 2014 grants are estimated to reduce 2,500 tons of NO<sub>x</sub>; 100 tons of PM; 250 tons of HC; 700 tons of CO; and 29,360 tons of CO<sub>2</sub>. These grants upgraded 400 engines or pieces of equipment, and the projects saved more than 2.6 million gallons of fuel.

Exhibit 7: FY 2014 DERA Funding by Sector



## Exhibit 8: FY 2014 DERA Technologies

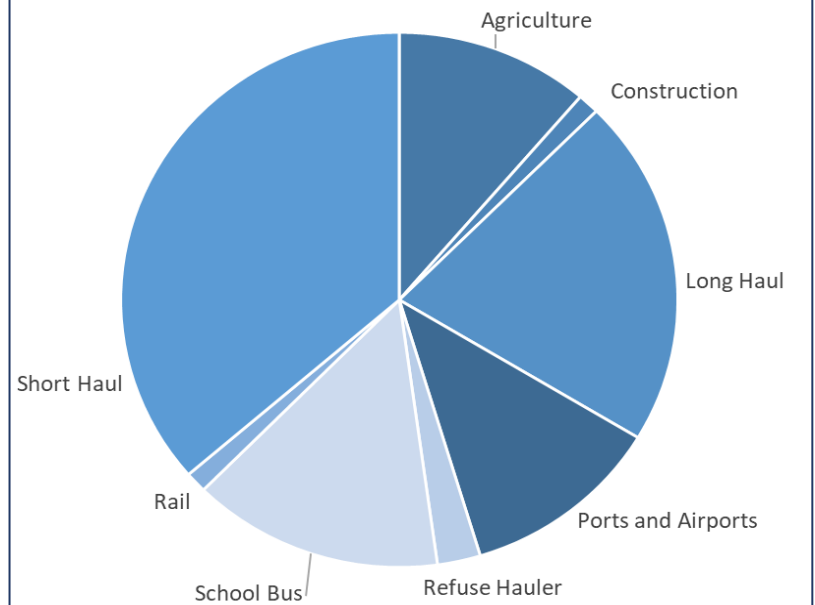


## Fiscal Year 2015 – National Grants

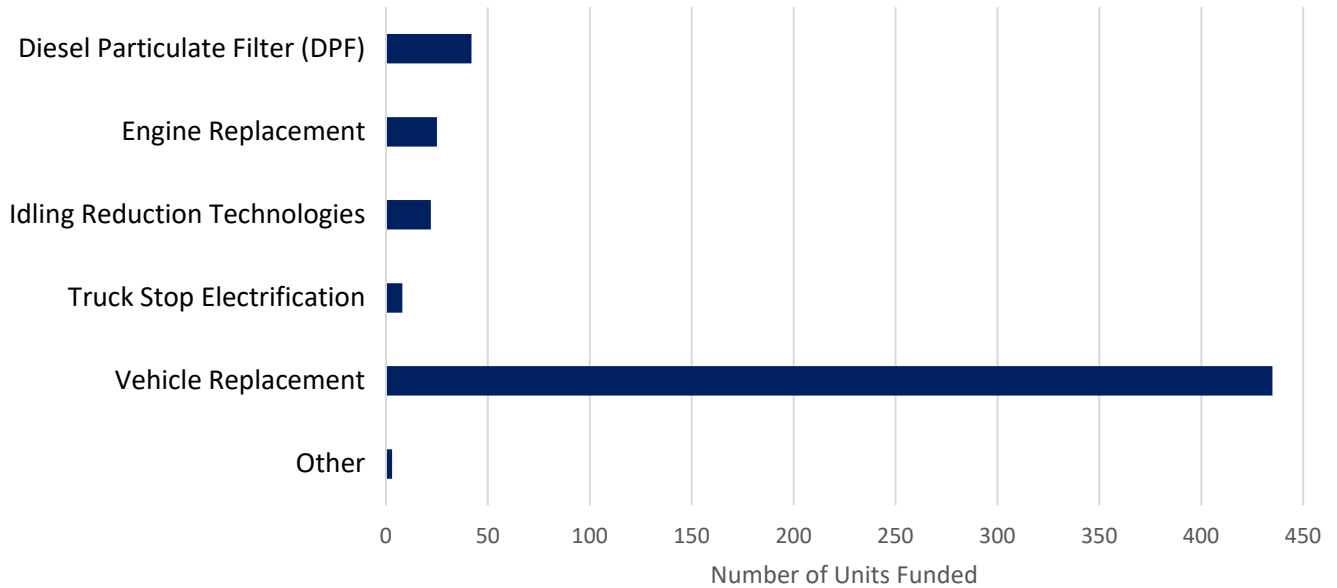
In FY 2015, EPA received a \$29.8 million appropriation for DERA. EPA funded 26 national competitive grants to reduce emissions from 479 diesel engines or pieces of equipment for a total of \$15.4 million. EPA received 42 applications seeking over \$35 million in funding. See Exhibit 9 and Exhibit 10 for project details.

DERA FY 2015 grants are estimated to reduce 3,275 tons of NO<sub>x</sub>; 180 tons of PM; 180 tons of HC; 955 tons of CO; and 51,304 tons of CO<sub>2</sub> over the lifetime of the affected engines. These projects also saved over 4.5 million gallons of fuel.

### Exhibit 9: FY 2015 DERA Funding by Sector



## Exhibit 10: FY 2015 DERA Technologies

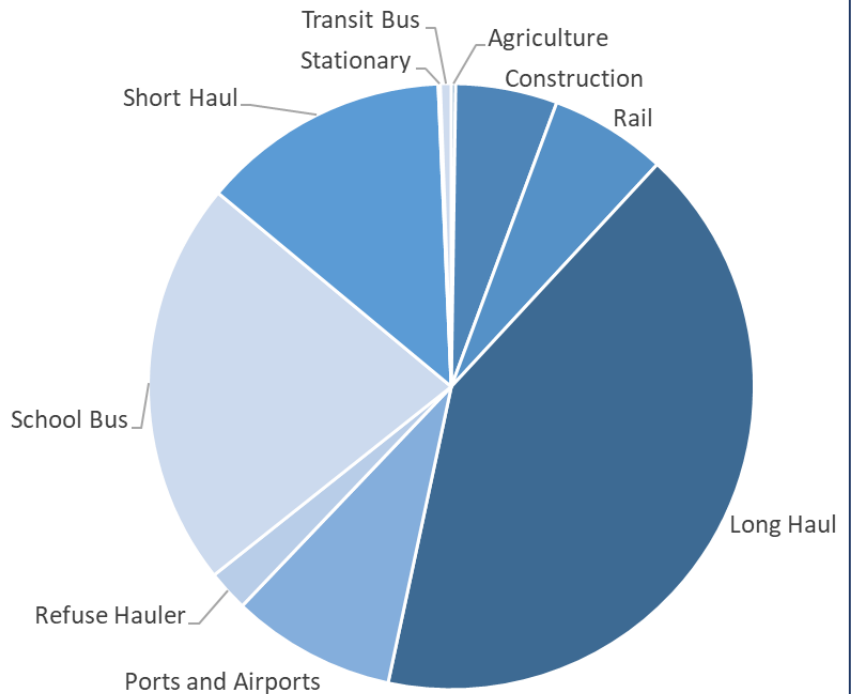


## Fiscal Year 2016 – National Grants

In FY 2016, EPA received a total appropriation of \$49.5 million for DERA. EPA received 81 applications seeking almost \$87 million in funding. EPA funded 35 competitive grants in FY 2016 for a total of \$32.9 million. These grants retrofitted or replaced 966 engines or vehicles. See Exhibit 11 and Exhibit 12 for project details.

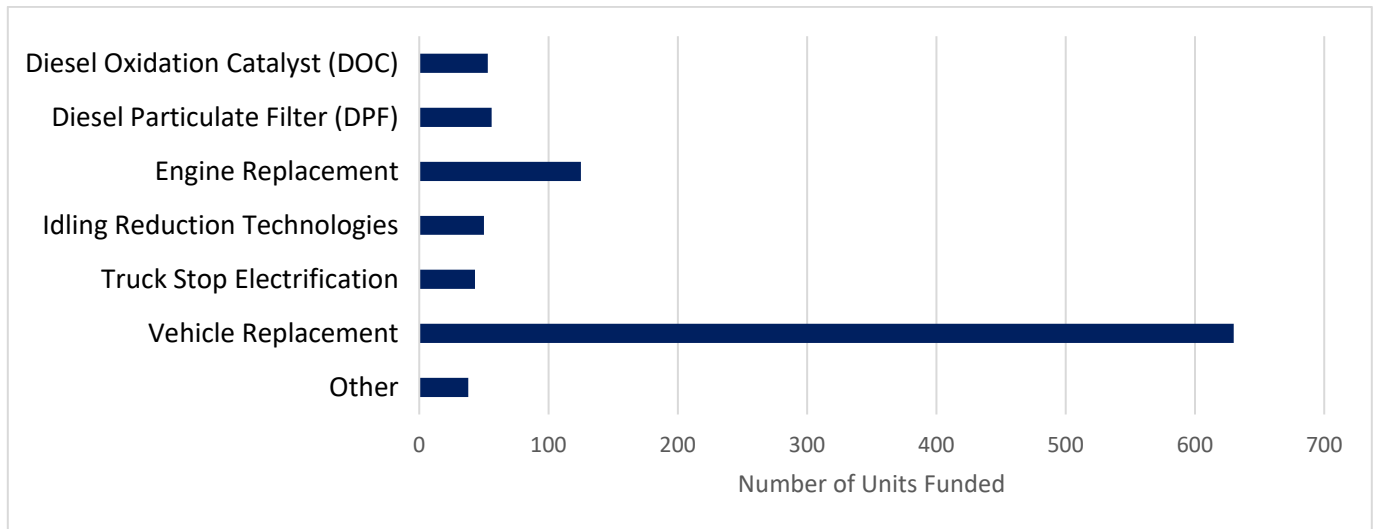
EPA estimates that over the lifetime of the affected engines DERA FY 2016 grants reduced 8,050 tons of NO<sub>x</sub>; 460 tons of PM; 490 tons of HC; 2,520 tons of CO; and 40,130 tons of CO<sub>2</sub>. These projects also saved more than 3.5 million gallons of fuel.

### Exhibit 11: FY 2016 DERA Funding by Sector





## Exhibit 12: FY 2016 DERA Technologies



## Moving Forward – National Grants

EPA continues to target DERA funds to maximize cost-effectiveness and make significant emission reductions in areas disproportionately exposed to diesel exhaust. The Agency continues to target those engines in the remaining fleet that have significant useful life left but are heavy emitters. These engines are often found at ports and are used for goods movement. Each funding opportunity has been crafted to attract and fund the most impactful projects, often in the goods movement sector. These projects may be in urban or rural areas.



For the national competitive program, demand from applicants continues to exceed program resources. During FY 2014 - FY 2016, applications included 2,660 engines that were not able to be funded through DERA from the following types of fleets: transit buses, short haul/delivery trucks, refuse haulers, locomotives, agriculture, construction, city/county vehicles, school buses, marine, ports and airports, and long-haul trucks.

## Exhibit 13: Reducing Emissions on School Buses through Retrofits<sup>1</sup>

Nearly 13,000 Diesel Oxidation Catalysts (DOCs) or DOCs + Closed Crankcase Ventilation (CCVs) have been installed on school buses with DERA funding, as well as approximately 1,400 Diesel Particulate Filters (DPFs). In 2014, EPA's Technology and Assessment Center within the Office of Transportation and Air Quality conducted in-use testing on DOCs and DPFs and confirmed these technologies achieve verified levels of emissions reduction and remain durable in real world applications. Between 2008 and 2012, multiple manufacturers' verified retrofit devices were procured by EPA and tested.

EPA typically tested devices from prior grant projects that were used on school buses in normal operation for two to four years and had accumulated up to 90,000 miles. All testing was performed on an engine dynamometer. Nine DPFs and three DOCS were tested for PM, HC, and CO. Each row in the tables to the right represents the emissions reduction for different models of DPFs and DOCs tested by EPA. Per the tables on the right, DOCs alone were shown to reduce PM emissions up to 20%, and DPFs up to 99%.

EPA Tested Emissions Reduction for DOCs			
DOC Model	PM	HC	CO
1	20%	76%	63%
2	16%	81%	66%
3	20%	70%	37%

EPA Tested Emissions Reduction for DPFs			
DPF Model	PM	HC	CO
1	94%	37%	N/A
2	64%	57%	55%
3	65%	72%	61%
4	51%	51%	53%
5	82%	74%	65%
6	99%	86%	73%
7	97%	92%	77%
8	98%	86%	77%
9	97%	87%	73%

<sup>1</sup> McCoy, B. J., & Tanman, A. (2014). Emissions Performance and In-Use Durability of Retrofit After-Treatment Technologies. *SAE International Journal of Engines*, 7(4). DOI: 10.4271/2014-01-2347.

## DERA Tribal Grants



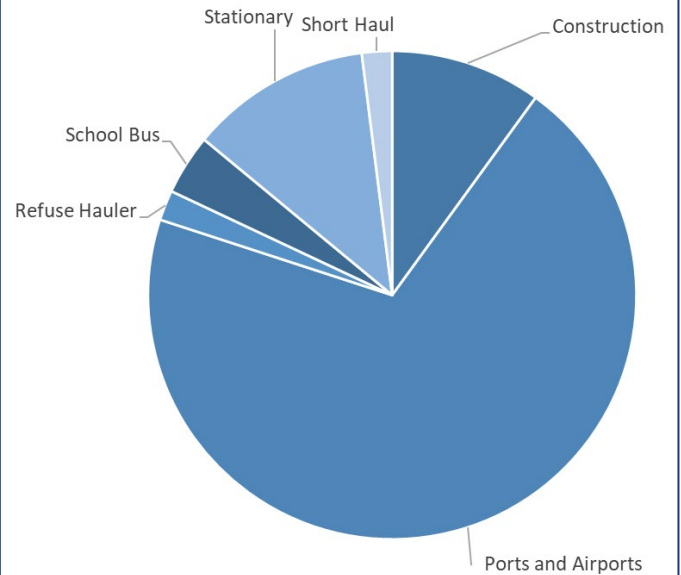
Photo of Swinomish Indian Tribal Community fishing vessel (2014 Tribal DERA engine replacement project)

2009/2010 and continues to offer flexibility and incentives to tribes working to address harmful diesel emissions.

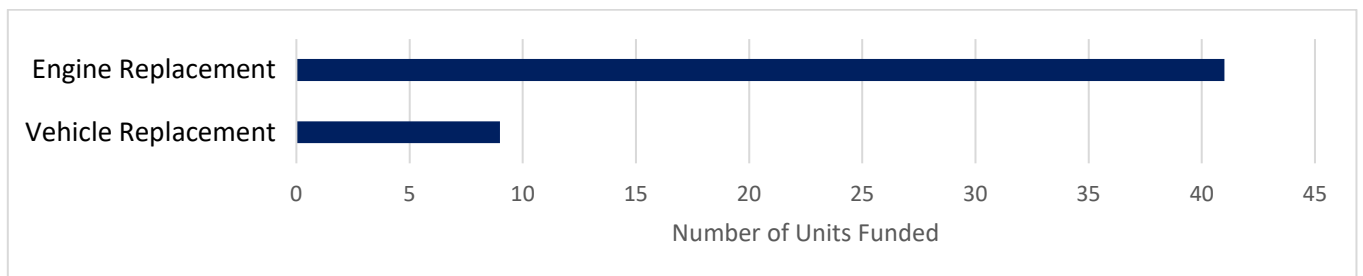
Between FY 2014-2016, EPA received 20 Tribal applications requesting nearly \$4.4 million in funding. EPA awarded [13 tribal grants](#) in Alaska, Arizona, California, New Mexico, Washington, and Wisconsin. These grants have provided \$3.7 million to retrofit or replace marine vessels, mining equipment, generators, municipal vehicles, and school buses.

A priority for the DERA program is to work with Tribes to reduce diesel emissions. There are 576 Federally Recognized Tribes in the U.S. Of those Federally Recognized Tribes and Native Villages, 229 are in Alaska. EPA began funding Tribal grants through the national competitive program in FY

**Exhibit 14: FY 2014-2016 DERA Tribal Funding by Sector**



## Exhibit 15: FY 2014-2016 DERA Tribal Technologies



## Moving Forward – Tribal Grants

During FY 2009-2013, Tribal funding was offered as a “set-aside” within the framework of the National grant program. In response to Tribal feedback, EPA began offering a stand-alone competitive tribal RFP in FY 2014 with \$1 million in available funding, and again in FY 2015 and in FY 2016 with \$1.5 million in available funding for each year. EPA appreciated stakeholder feedback on the Tribal Grants, which has largely supported stand-alone RFPs for Tribes. EPA is committed to strengthening partnerships with Tribal communities and, contingent upon future appropriations and Congressional direction, plans to continue to offer a stand-alone RFP for Tribes with targeted Tribal outreach.

### Tribal DERA Generator Replacement Project in Rampart Village, AK



Power generation in rural Alaska depends on diesel generators, often operating in the center of a village, close to homes, workplaces, and the school. The age and proximity of generators to these buildings may pose a risk to the health of the community. Replacing the generators in these facilities with ones that meet more stringent emission requirements will reduce emissions.



This FY 2015 project included the replacement of two stationary diesel generators used for energy production in the Rampart Village with cleaner, more efficient generators. EPA contributed \$158,883 (71%) of the total cost of the project. The improved efficiency will require less fuel, again reducing emissions, with the added benefit of lowered costs. In Rampart, Alaska, diesel fuel can cost upwards of \$6.50 a gallon, so these generators provide significant cost savings.

## Section 2: DERA State Program

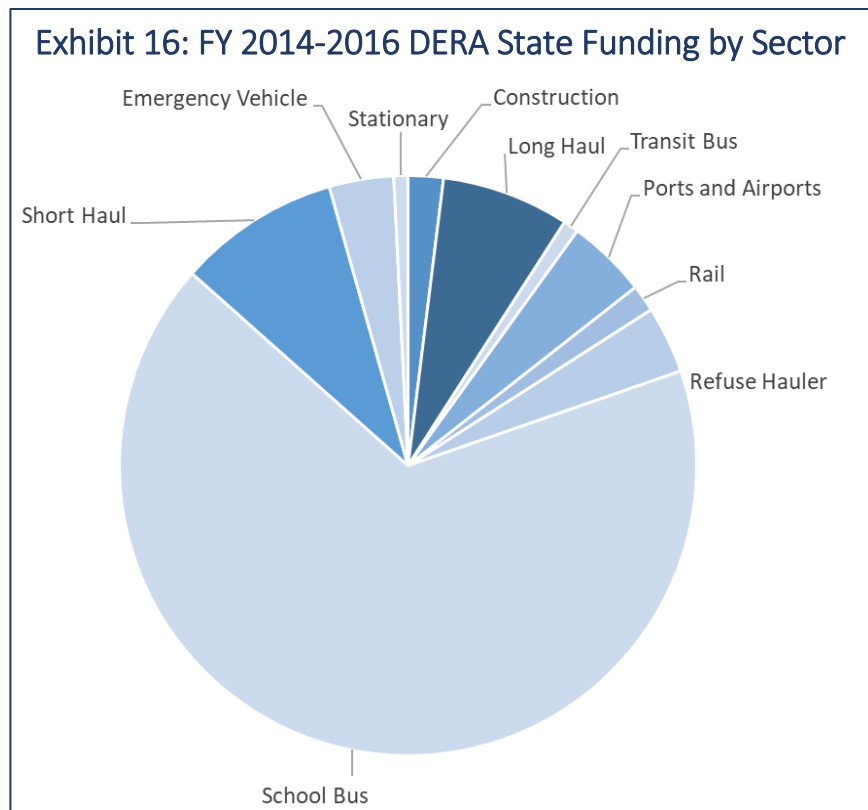
The DERA legislation requires EPA to offer 30% of the annual appropriation to states and territories to implement their own clean diesel programs. Eligible entities include government agencies in the fifty states, the District of Columbia, Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Northern Mariana Islands. Agencies run their own funding programs to implement projects and offer funding to fleets within their states. State agencies must select projects according to EPA's eligibility and cost-share requirements, but the selections are made entirely by the states to best fit state and local needs. Per the DERA statute, EPA offers states and territories a base funding amount, and if they match this amount dollar-for-dollar, EPA offers additional DERA funds equal to 50% of the base amount.

### FY 2014-2016 State Grants

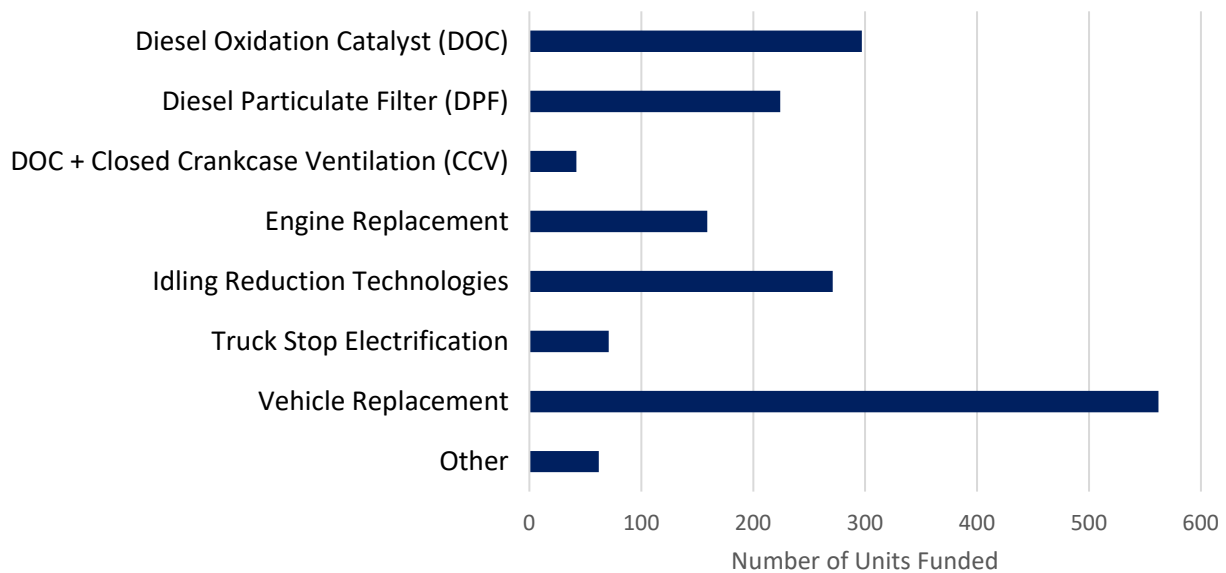
In total, states and territories received \$23.2 million in FY 2014-2016 funds<sup>1</sup>. EPA awarded grants to 48 of 56 eligible states and territories over these years to fund the projects highlighted in Exhibit 16 and Exhibit 17. Over the lifetime of the affected engines these projects are estimated to reduce 3,670 tons of NO<sub>x</sub>; 200 tons of PM; 360 tons of HC; 1,015 tons of CO; and 110,115 tons of CO<sub>2</sub>. These projects also saved nearly 10 million gallons of fuel and retrofitted or replaced 1,520 engines or pieces of equipment.

---

<sup>1</sup> FY 2014-2016 state grant results are combined because the FY15 and FY16 funds were awarded as increases and extensions to the FY14 grant awards.



**Exhibit 17: FY 2014-2016 DERA State Technologies**





## Dray Truck Project Improving Air Quality at the Port of Virginia



The Virginia Department of Environmental Quality managed a diesel emission reduction program for dray trucks at the Port of VA, one of the top ten busiest American ports based on import and export container volume.

During the 3-year program period, six retrofits were installed on engine model year 2007 and older dray trucks serving terminals at the Port of VA. The grant funding paid for 100% of the cost of retrofit materials and installation. During the second and third years of funding, truck replacements were added to the State DERA grant. The replacement portion of the project offered up to \$27,500 for a down payment on engine model year 2010 or newer dray trucks. There were thirteen pre-2007 engine model year trucks scrapped and replaced as part of the grant. These dray truck projects reduce the harmful diesel emissions from the volume of trucks making multiple trips in and out of the port each day, which benefits the port community.

## Moving Forward – State Grants

Since FY 2014, EPA has allowed participants in the state grant program to submit waiver requests from the programmatic eligibility requirements to best accommodate the unique challenges that different states and territories face in cleaning up their diesel fleets. EPA reviews and grants waiver requests on a case-by-case basis to ensure that the waiver is justified and that projects will still achieve emission reductions. Most participants complete projects without waivers, but EPA has continued to offer waivers in this non-competitive program.

Starting in FY 2017, states have had the option to use their allocation of the Volkswagen Environmental Mitigation Trust funds to match EPA state grants. While these funds cannot cover the mandatory cost-shares for DERA projects, states opting to use some or all of their allocation of Volkswagen trust funds for the available [“DERA Option”](#) have had a broader list of diesel emission reduction projects to choose from than are available under the other nine eligible mitigation actions under the Mitigation Trust.

## Section 3: DERA School Bus Rebate Program

A significant change in the DERA reauthorization, signed in January 2011, provided EPA with the authority to award rebates. Rebates may be awarded to public institutions and some non-profit organizations, and private entities if they have a license, lease or contract with an eligible public organization. The [National Clean Diesel Rebate Program](#) was the first-ever rebate program within EPA.

Rebates and grants differ in a variety of ways. One distinction is the simplified application process for rebates, which applicants prefer, compared with the higher administrative burden of the grant process. Rebates specify exact project requirements and eligibility. This allows for a more streamlined application, selection, and payment process. The rebate amount is specified up front and, once the selected applicant has completed all work, they are reimbursed with the rebate amount. EPA uses a lottery system to select school bus rebate winners. The simple rebate process allows EPA to run each rebate funding opportunity in a short timeline, with the timespan between the application deadline and disbursing funds being less than one year.

### The 2014-2016 School Bus Rebate Program

School buses play an integral role in reducing emissions and improving public health of children, which is a very high priority for EPA. The EPA National Clean Diesel Campaign (NCDC) has a long and successful history implementing clean diesel projects in the school bus sector.

Because of overwhelming interest in the \$2 million 2012 School Bus Replacement Rebate Program, EPA offered more funding for school bus replacements in 2014, 2015, and 2016. These funding opportunities were targeted at school bus fleet owners with pre-2007 engine model year diesel buses seeking to replace those buses with new school buses with modern exhaust control technologies. Eligible replacement school buses may operate on ultra-low sulfur diesel, battery, or alternative fuels like propane or compressed natural gas. Health benefits are achieved by scrapping the old buses and replacing them with cleaner ones.

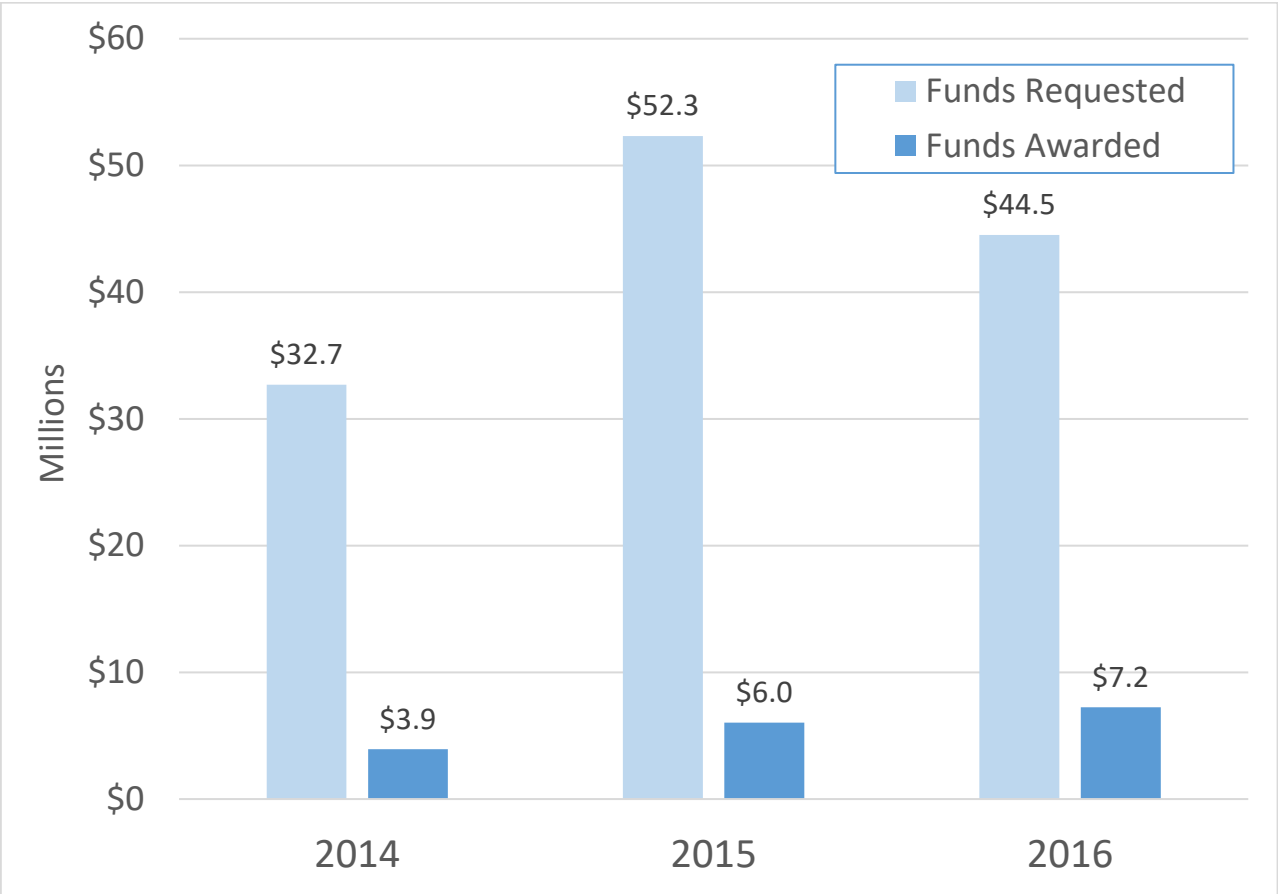
Over the FY 2014, 2015, and 2016 rebate programs, EPA received nearly 1,600 applications requesting \$130 million dollars in rebate funds, see Exhibit 18. EPA awarded \$17 million in rebates for 224 fleets to replace 858 school buses. Given the level of interest in the program, EPA lowered the rebate amount from approximately 25% to 20% of the cost of a new bus to improve cost effectiveness. Bus replacements funded through the rebate program result in reduced particulate matter and NO<sub>x</sub> pollution exposure for children at schools, bus stops, and on the buses themselves.



### Improving Air Quality Through Replacing Old School Bus Fleets

The Lawton-Bronson Community School District in Lawton, Iowa participated in the 2016 School Bus Rebate Program. They were awarded \$80,000 in rebate funds to replace four 1999-2001 engine model year diesel school buses with four 2017 engine model year propane school buses. The rebate covered approximately 20% of the cost of the new buses. The chassis and engines from the old buses were scrapped to prevent resale and further pollution.

Exhibit 18: School Bus Rebate Funds Awarded and Requested



## Moving Forward - Rebates

As a pilot, the FY 2015 and 2016 rebate programs offered funding for DOC retrofits in addition to school bus replacements. Over these years, rebates for bus replacements continued to be one of the most popular projects funded under DERA, but we did not see significant interest in retrofits, with only 10 DOCs being funded in the FY 2015 and 2016 rebate programs. Retrofits continue to be popular and highly cost-effective when funded by DERA grants, but they may not fit well with the simplified rebate program that targets individual school bus fleets.

Given the success of the rebate program and the importance of children's health, EPA intends to fund more school bus rebates in the future. These rebates make a visible impact in communities across the country by providing children with healthier rides to school.

## Section 4: DERA Funding at Ports

Ports play a significant role in the nation's transportation system and goods movement supply chain. Many ports are in low-income and minority communities which are often disproportionately impacted by diesel emissions associated with port activities. Ships and harbor craft are usually the largest contributors of diesel pollution at ports. Additionally, cargo handling equipment, drayage trucks, and locomotives can be significant contributors to diesel pollution at ports. Port authorities, terminal operators, fleet owners, drayage truckers, and rail operators all have a role in reducing diesel emissions at ports and nearby communities where tens of millions of people live and work. Reducing exposure to diesel exhaust in and near ports is key for public health and the environment.

Since 2008, fleets at marine and inland water ports have been a priority for DERA funding with \$93 million (\$38 million from ARRA) going to ports projects from 2008-2013. In FY 2013, EPA set aside \$4 million for the first year of a stand-alone Ports DERA RFP. Eligible entities included public port authorities at marine or inland ports. Community groups, local governments, terminal operators, shipping carriers, and other business entities involved in port operations were encouraged to partner with these port authorities.

In FY 2014 EPA issued a second stand-alone Ports RFP and received 15 applications requesting over \$15.7 million in funding. EPA awarded \$5 million for four projects that replaced drayage trucks, retrofitted cargo handling equipment, replaced a diesel crane with an electric crane, and replaced ferry engines. This FY 2014 Ports RFP projects reduced an estimated 2,290 tons of NO<sub>x</sub>; 69 tons of PM; 80 tons of HC; 323 tons of CO; and 55,990 tons of CO<sub>2</sub> over the lifetime of the affected engines. These projects also saved nearly 5 million gallons of fuel. In addition to the FY 2014 Ports RFP, an additional \$4 million was awarded for ports projects through the National and State DERA grant programs in 2014.

In subsequent years, EPA did not issue a stand-alone ports RFP in order to reduce the burden associated with multiple grant opportunities. Instead, ports and goods movement were prioritized in the DERA National grant program by awarding additional points for ports and goods movement projects. The total funding for ports projects under the National and State grant programs was \$6 million in 2015 and increased to \$14 million in 2016.

### Moving Forward - Ports

DERA funding has been instrumental in furthering emission reductions through ports-related clean diesel projects. EPA anticipates that DERA will continue to prioritize diesel emission reductions at ports and other freight distribution centers to complement the work being done by the port industry, communities,



and all levels of government to improve environmental performance and increase economic prosperity.

EPA has launched a [Ports Initiative](#) to further address air quality issues at and near ports. EPA is taking into consideration recommendations in the Clean Air Act Advisory Committee (CAAAC)'s September 2016 report to the EPA Administrator. This [Report](#), produced by a [Ports Initiative Work Group](#) under the Mobile Source Technical Review Sub-Committee, contains recommendations on how funding can be targeted to communities at and near ports, among others.

As of 2017, the DERA National grant review process has prioritized applications which include benefits to affected communities, community engagement and partnerships, and project sustainability at and near ports. As a result, benefits are multiplied in the form of both emissions reductions as well as community involvement.



### Port of LA: Electric Crane Project

Cargo handling equipment at the Port of L.A. is a major contributor of pollutants in the South Coast Air Basin, emitting over 500 tons of NO<sub>x</sub> per year. Pollution from off-road heavy duty equipment at the San Pedro Bay ports (L.A. and Long Beach) and the Southern California freight industry comprises over 10% of fine particulate matter (PM<sub>2.5</sub>) emissions and nearly a third of NO<sub>x</sub> emissions in the basin.

These pollutants can contribute to significant health problems such as premature mortality, increased hospital admissions for heart and lung disease, increased cancer risk, and increased respiratory symptoms – especially for children, the elderly, outdoor workers, and other sensitive populations.

In 2014, the EPA granted \$1.3 million of DERA funding for a new electric crane. This is the LA Harbor Department's first electric mobile ship-loading crane for non-container cargo, an important step in the port's goal of becoming a zero-emission green port.



# Lessons Learned for the DERA Program

The DERA program is committed to strong stewardship of the funding and continued strengthening of management and oversight of the program. Following recommendations from the [U.S. EPA's Office of Inspector General's 2014 report](#), the program revised methodologies for emissions reporting, offered yearly project officer and grantee training, created technical guidance related to DERA -specific assistance agreement management, and continued baseline and advanced monitoring on the DERA program. In addition, a third-party audit is planned for the school bus rebate program in 2018-2019.

EPA evaluates every DERA funding opportunity each fiscal year to ensure that funding continues to yield significant environmental benefits and also to improve the experience for applicants. The program welcomes feedback from potential beneficiaries through our [website](#), [helplines](#), [regional collaboratives](#), conferences, and webinars. We adapt the program as technologies and demands change.

In recent years, the program has seen greater interest in vehicle replacements and reduced interest in after-market tailpipe technologies. The program continues to fund 100% of the cost of these tailpipe technologies, as they are one of the most cost-effective emission reduction solutions. In addition, the program has responded to changing interest by increasing EPA cost-shares for replacements, including zero-emission technologies. These newer technologies yield greater emission reductions, but cost more upfront, such as engines that meet California's optional low-NOx emissions standard. As more communities and fleets become interested in zero-emission technologies, the program will seek to balance the types of technologies available in relation to the resources available.

Similarly, the program has continually updated its web-based emission reductions calculator, the Diesel Emissions Quantifier (DEQ), to improve the accuracy of its emission reduction estimates. The updates include emission factors based on EPA's [MOVES model](#) and useful life estimates for the replaced engines.

In summary, because of changes in demand for retrofits, improvements to our emissions calculator and reductions in the pool of legacy diesel vehicles over time, the cost per ton of emission reductions of the DERA program has increased slightly. However, even with these changes, DERA remains a highly cost-effective program for reducing harmful emissions.

## Looking Ahead for the DERA Program

Even with implementation of EPA's stringent standards for new on-highway and nonroad engines, EPA estimates that approximately one million engines from the legacy fleet will remain in use in the year 2030. These engines will continue to affect the environment and public health and will not be touched by fleet turnover.



Some of these engines will be decades old, pre-dating modern engine technology, yet still in use. In fact, EPA estimates that in 2025, mobile sources will still make up about 45% of total NO<sub>x</sub> sources, with the legacy fleet contributing 11% of mobile source NO<sub>x</sub> emissions. In addition, mobile sources will represent about 6% of the direct PM emissions, with the legacy fleet contributing approximately 14% of the direct PM emissions from mobile sources in the year 2025.<sup>1</sup> The DERA program is designed to target retrofit, removal and replacement of these remaining engines of the legacy fleet to protect public health and the environment.

The public health impact of diesel engine emissions has received significantly more attention since the first projects were funded under DERA in 2008. Accordingly, many countries around the world and states within the USA are devoting more resources to diesel emission reductions. One new major source of funding available to states and tribes are the Volkswagen Environmental Mitigation Trusts. These Trusts offer nearly \$3 billion to fully mitigate the total, lifetime excess NO<sub>x</sub> emissions from the violating vehicles. Beneficiaries to the Trusts may use these funds for the replacement or repower of medium and heavy-duty diesel engines or pieces of equipment and light-duty zero emission vehicle supply equipment.

Along with the Volkswagen Environmental Trusts, state programs like the [Texas Emissions Reduction Plan \(TERP\)](#), [California's Carl Moyer program](#), and other funding opportunities like the Department of Transportation's [Congestion Mitigation and Air Quality Improvement \(CMAQ\) Program](#) all provide financial incentives to help to reduce the size of the legacy diesel fleet. However, with

---

<sup>1</sup> 2025 estimates based on MOVES2014b and marine inventory modeling

nearly 10 million legacy heavy-duty diesel engines still in operation today, these programs, in addition to DERA, can only address a fraction of these dirty engines.

The Diesel Emissions Reduction Act was authorized through 2016 but received annual appropriations of \$60 million in FY 2017 and \$75 million in FY 2018. In FY 2017, EPA awarded 35 grants in the National Program, 49 grants to states and territories in the State Program, 3 grants in the Tribal Program, and funds for 415 school bus replacements in the Rebate Program. EPA will report on the results of FY 2017 and FY 2018 DERA projects in the next Report to Congress.

As the program looks ahead to the challenges of cleaner goods movement through the nation's supply chain, reducing black carbon pollution, and assisting environmentally challenged communities, the DERA program will continue to prioritize the following statutory and programmatic goals and objectives:

- Target areas and populations with disproportionate levels of exposure to diesel exhaust while maximizing cost-effectiveness.
- Prioritize children's health with a goal of every child riding to school in a bus that meets the latest on-highway standards.
- Target projects that reduce emissions from engines involved in goods movements and freight and frequently found operating at ports.
- Design each DERA program opportunity to fund the most beneficial projects and maximize cost-effectiveness.
- Continue building partnerships with key stakeholders to achieve program goals.
- Aid state and local governments in the development of their own clean diesel programs.
- Continue verifying performance of emission reduction technologies in the field.
- Maximize health benefits from clean diesel projects.
- Seek sustainable projects which promote community driven solutions in those communities most impacted by diesel emissions.

## Appendix A: List of DERA Projects

**DERA and ARRA-funded national competitive and Ports RFP projects:**

[www.epa.gov/cleandiesel/clean-diesel-national-grants-awarded](http://www.epa.gov/cleandiesel/clean-diesel-national-grants-awarded)

**Tribal projects:**

[www.epa.gov/cleandiesel/tribal-awarded-grants](http://www.epa.gov/cleandiesel/tribal-awarded-grants)

**State Allocations:**

[www.epa.gov/cleandiesel/state-allocations](http://www.epa.gov/cleandiesel/state-allocations)

**Rebates:**

[www.epa.gov/cleandiesel/awarded-rebates](http://www.epa.gov/cleandiesel/awarded-rebates)

For other information about the DERA funding opportunities, please see [www.epa.gov/cleandiesel](http://www.epa.gov/cleandiesel).