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INTERIM MEMORANDUM- DRAFT

Investigation of Funding Sources for Texas Transportation Air Quality Improvement Projects

Prepared by the Texas A&M Transportation Institute

Prepared for the Texas Department of Transportation

August 2015

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DRAFT FOR REVIEW

Investigation of Funding Sources for Texas Transportation Air Quality Improvement Projects

Air Quality and Conformity Inter-Agency Contract

Subtask 2.1 – FY 2015

Prepared for

Texas Department of Transportation

By

Texas A&M Transportation Institute

August 2015

TECHNICAL MEMORANDUM—DRAFT FOR REVIEW

Inter-Agency Contract (Contract No: 50-4XXIA032)

Task 2.1 Investigation of Funding Sources for Texas Transportation Air Quality Improvement Projects

DATE: August 9, 2016

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Texas Department of Transportation (TxDOT)

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INVESTIGATION OF FUNDING SOURCES FOR TEXAS TRANSPORTATION AIR QUALITY IMPROVEMENT PROJECTS

1. INTRODUCTION

This report summarizes findings from Subtask 2.1 (Technical Working Group [TWG] Air Quality [AQ] Planning Technical Issues Analysis) of the Air Quality and Conformity Interagency Contract (IAC), focused on funding opportunities for air quality improvement projects. The goal of this task was to gain insight and identify funding for transportation air quality improvements that could result in emissions reductions in the state, and potentially lead to gaining emissions credits for regional emission reduction efforts. This task also aimed to determine if Texas agencies might be missing funding opportunities due to resource constraints or lack of awareness or expertise on specific topics. The ultimate aim of this work was to develop a facilitation strategy to allow the Texas Department of Transportation (TxDOT) and its partner agencies to pursue potential funding opportunities in a strategic manner.

The focus of the study is on air quality improvement funding opportunities from traditional sources (such as federal agencies) within the United States, which are the primary expected source of funding opportunities. Initial investigation into air quality funding available from private foundations led to the conclusion that this may deserve a separate effort later. The information in this report is structured within a broad funding opportunity framework detailing how the main funding entities approach their funding activities and what they aim to achieve.

This document is an updated version of the report submitted to TxDOT in fiscal year (FY) 2014, with additional material incorporated based on the work performed in FY2015.

2. APPROACH

There are many actors engaged in the business of reducing transportation-related mobile source emissions. Federal, state, regional, and local agencies, as well as nonprofits, advocacy groups, and other nongovernmental organizations (NGOs), all play a unique role. They operate within a regulatory and programmatic framework that includes plans and programs, federal and nonfederal regulations, and state legislations.

There are many organizations in Texas that already receive significant funding, such as the State of Texas (TxDOT, Texas Commission on Environmental Quality [TCEQ]), metropolitan planning organizations (MPOs), regional entities, counties, and local entities. There are others that could benefit (some are already receiving funding), such as transit operators, school districts, fleet owners, businesses, and individuals.

One of the main funding sources within the transportation sector is the Congestion Mitigation and Air Quality (CMAQ) Program for transportation air quality improvement as part of the Moving Ahead for Progress in the 21st Century Act (MAP-21) and made available by the U.S. Department of Transportation (USDOT). This funding is provided to states and local authorities and focuses on air quality in nonattainment and maintenance areas.

The initial review conducted in FY2014 focused on initiatives outside of the MAP-21 and CMAQ funding mechanism. The focus was on the federal agencies intimately involved in environment and air quality programs, such as the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE), and large interagency cooperative programs.

This FY2015 report includes additional discussion of the CMAQ funding environment and the experiences of Texas entities. Clean school bus initiatives that were identified as a potential growth area are looked at in detail, along with current opportunities under health and transportation initiatives.

The information in this report was compiled from reports and information available on the websites of organizations involved in the area of transportation air quality improvement. Additional information was obtained through discussions with experts and a workshop

[1] with transportation practitioners in Texas. The workshop was held by TTI, on behalf of TxDOT, in College Station, Texas, on August 3rd, 2015. Table 1 provides a summary of the funding opportunity framework that was developed as a means of organizing and identifying relevant organizations and programs that are then discussed further in this report.

Table 1. Funding Opportunity Framework.

Agency	**Environmental Protection Agency**		**Multiagency**		**Department of Energy**
Offices and Divisions	Office of Transportation and Air Quality Transportation and Climate Division	Office of Sustainable Communities	EPA, DOE, Department of Housing and Urban Development	DOC, DOD, DOE, DOI, EPA, HHS, NASA, NSF, USAID, USDA	Office of Energy Efficiency and Renewable Energy Vehicle Technology Office
Programs	Diesel Emission Reduction Act	Smart Growth	Sustainable Communities Partnership	U.S. Climate Change Technology Program	Clean Cities Sustainable Transportation Energy Efficiency and Conservation
Supporting Entities	EPA Regions National Vehicle and Fuel Emissions Laboratory Collaboratives				National Renewable Energy Laboratory
Other	Health and Transportation Other Federal (MAP-21, CMAQ)		Private Foundations		

Note: DOC—Department of Commerce; DOD—Department of Defense; DOE—Department of Energy; DOI—Department of the Interior; EPA—Environmental Protection Agency; HHS—Department of Health and Human Services; NASA—National Aeronautics and Space Administration; NSF—National Science Foundation; USAID—United States Agency for International Development; USDA—U.S. Department of Agriculture.

3. EPA, DOE, AND MULTIAGENCY PROGRAMS AND OPPORTUNITIES

EPA is a major provider of air quality improvement funding. EPA's funding for transportation is distributed mainly through programs administered by the Office of Transportation and Air Quality and the Office of Sustainable Communities. DOE's funding opportunities are distributed through programs within the Office of Energy Efficiency and Renewable Energy.

EPA and DOE are involved in a number of multiagency programs in which air quality improvements play a role. The Sustainable Communities Partnership and the U.S. Climate Change Technology Program are two major initiatives.

3.1 Environmental Protection Agency

3.1.1 Background

The EPA is working to meet air quality challenges for the future. EPA's research programs support its strategic goals:[2] addressing climate change and improving air quality, protecting America's waters, cleaning up communities and advancing sustainable development, ensuring the safety of chemicals and preventing pollution, and protecting human health and the environment by enforcing laws and ensuring compliance.

3.1.2 Greenhouse Gas Emissions and Climate Change

Working across EPA and in partnership with other agencies, EPA works to reduce greenhouse gas (GHG) emissions from the transportation and energy sectors and hydrofluorocarbons (HFCs) through the Significant New Alternatives Policy Program. The majority of transportation greenhouse gas emissions are carbon dioxide (CO_2) resulting from the combustion of petroleum-based products, like gasoline, in combustion engines. Small amounts of methane (CH_4) and nitrous oxide (N_2O) are emitted during fuel combustion. In addition, a small amount of HFC emissions are in the transportation sector and result from the use of mobile air conditioners and refrigerated transport.

In 2012, greenhouse gas emissions from transportation accounted for about 28 percent of total U.S. greenhouse gas emissions, making transportation the second largest contributor. GHG emissions from transportation have increased by about 18 percent since 1990. This can be attributed to increased travel demand and freight movement, relative to gains in fuel efficiency that could reduce emissions. The number of vehicle miles traveled by passenger cars and light-duty trucks increased 35 percent from 1990 to 2012.

The following lists a variety of ways that greenhouse gas emissions associated with transportation can be reduced.

Fuel Switching

Fuel switching consists of using fuels that emit less CO_2 than the fuels currently being used. Alternative sources can include biofuels; hydrogen; electricity from renewable sources, such as wind and solar; or fossil fuels that are less CO_2-intensive. Examples include:

- Using public buses fueled by compressed natural gas rather than gasoline/diesel.
- Using electric or hybrid vehicles with lower-carbon or non-fossil fuel energy.
- Using renewable fuels such as low-carbon biofuels.

Improving Fuel Efficiency with Advanced Design, Materials, and Technologies

Examples of advanced technologies, design, and materials for more fuel-efficient vehicles are:

- Developing advanced vehicle technologies such as hybrid vehicles and electric vehicles that can regenerate and store energy from braking and use it for power later.
- Reducing the weight of materials used to build vehicles.
- Reducing the aerodynamic resistance of vehicles through better shape design.

Improving Operating Practices

Practices that minimize fuel use and improve driving practices and vehicle maintenance include:

- Reducing the average taxi time for aircraft.
- Driving sensibly (avoiding rapid acceleration and braking, observing speed limits).
- Reducing engine idling.
- Improving voyage planning for ships, such as through improved weather routing, to increase fuel efficiency.

Reducing Vehicular Travel Demand through Urban Development

More efficient urban development can reduce the miles people drive. The need to drive is reduced through travel efficiency measures such as commuter, biking, and pedestrian programs. Examples include:

- Building public transportation, sidewalks, and bike paths to increase lower-emission transportation choices.
- Zoning for mixed-use areas so that residences, schools, stores, and businesses are close together, reducing the need for driving.

3.1.3 Air Quality Improvement Opportunities

The majority of air quality improvement funding opportunities through EPA can be found in programs administered by two offices: the Office of Transportation and Air Quality (OTAQ) and Office of Sustainable Communities (OSC).

OTAQ, through its Transportation and Climate Division (TCD), administers the Diesel Emission Reduction Act (DERA). The intention has been to allocate 60 percent of the funding to the National Clean Diesel Campaign (NCDC), under which the Clean School Bus Program falls. Thirty percent of DERA funding is allocated directly to states, 6 percent to the SmartWay® Transport Program, and 4 percent to Emerging Technologies, as shown in Table 2.

Table 2. EPA Funding Framework for Air Quality Improvement.

<table>
<tr><th colspan="6">ENVIRONMENTAL PROTECTION AGENCY</th></tr>
<tr><td>Office</td><td colspan="4">Office of Transportation Air Quality</td><td>Office of Policy</td></tr>
<tr><td>Subsidiary Office</td><td colspan="4">Transportation and Climate Division</td><td>Office of Sustainable Communities</td></tr>
<tr><td>Source Program</td><td colspan="4">Diesel Emission Reduction Act</td><td>Smart Growth</td></tr>
<tr><td>Program</td><td>National Clean Diesel Campaign (60%)</td><td rowspan="2">State Allocated Funding (30%)</td><td rowspan="2">SmartWay Transport Program (6%)</td><td rowspan="2">Emerging Technologies (4%)</td><td rowspan="2">Initiatives</td></tr>
<tr><td>Sub-program</td><td>Clean School Bus</td></tr>
<tr><td>Supporting Entities</td><td colspan="4">National Vehicle and Fuel Emissions Laboratory
EPA Regions
Collaboratives</td></tr>
</table>

OSC, within the Office of Policy, administers the Smart Growth initiatives. OTAQ, TCD, and OSC are supported by EPA regions, established collaboratives, and the National Vehicle and Fuel Emissions Laboratory (NVFEL).

Office of Transportation and Air Quality

OTAQ's mission is to protect human health and the environment by:

- Reducing air pollution and greenhouse gas emissions from mobile sources and the fuels that power them.

- Advancing clean fuels and technology.
- Encouraging business practices and travel choices that minimize emissions.

OTAQ's programs address emissions from a range of mobile sources: automobiles and light trucks, large trucks and buses, farm and construction equipment, lawn and garden equipment, non-road recreational vehicles (e.g., dirt bikes and snowmobiles), marine engines, aircraft, and locomotives.

OTAQ's primary activities include:

- Assessing mobile source-related air quality problems and developing sophisticated modeling tools to develop solutions, measure results, and support emission inventories.
- Establishing national standards to reduce emissions from on-road and non-road mobile sources of pollution.
- Implementing national mobile source standards through certification processes and in-use monitoring strategies.
- Developing fuel efficiency programs and technologies to reduce the emission of greenhouse gases from the transportation sector.
- Researching, evaluating, and developing advanced technologies for controlling emissions, as well as developing new strategies for improving fuel efficiency.

OTAQ's National Vehicle and Fuel Emissions Laboratory provides OTAQ with emissions testing services in support of rulemakings, certification, enforcement actions, and test procedures.[3]

Transportation and Climate Division

TCD within the OTAQ administers the DERA.[4]

In 2005, the U.S. Congress passed the Diesel Emission Reduction Act amending the Energy Policy Act. DERA offers grant funding to entities aiming to reduce diesel emissions and improve efficiency nationwide. EPA regional project officers, technical staff, and collaboratives help manage DERA.

Diesel vehicles fall into four main categories: on-highway, non-road, marine, and locomotives. To be eligible for DERA grants, on-highway vehicles must be equipped with medium heavy-duty or heavy heavy-duty certified engines. These engines are used in Class 5, 6, 7, and 8 vehicles, such as school and transit buses, refuse haulers, short-haul trucks, long-haul trucks, and emergency and service vehicles. All school buses are eligible for DERA.

Non-road vehicles include those used in construction, cargo handling at a port or airport, agriculture, mining, or energy production (including stationary generators or pumps). The type of projects considered fall into the categories of exhaust controls, crankcase controls, idle reduction technologies, engine repowers, vehicle and equipment replacements, engine upgrades, aerodynamic technologies and low rolling resistance tires, and cleaner fuel use.

DERA Funding

DERA was originally appropriated funding through Congress in 2008, and appropriations have continued each year through 2014. In 2009, DERA was included as a program under the American Recovery and Reinvestment Act (ARRA). Under this act, DERA received $300 million nationwide.

From 2008 to 2011, there were four different pools of funding within DERA: state DERA funding, the National Clean Diesel Campaign, the Emerging Technology Program, and the SmartWay Innovative Finance Program. Each of the four different pools has been allocated a certain percentage of total DERA funds appropriated by Congress each year.

In January 2010, DERA grants were reauthorized for projects that reduce emissions from existing diesel engines. Congress appropriated $100 million annually for FY2012 through FY2016. New types of funding mechanisms are allowed, including rebates.

State Allocated DERA Funding

The State Allocation Program divides noncompetitive funding evenly among the 50 states, Washington, D.C., and several U.S. territories. The funding must be used to fund eligible clean diesel projects. The requirements for eligible projects under this grant have changed several times since 2008. Each year since this program began, this funding has included a match incentive, through which the states are awarded an additional 50 percent of the original award if they can match the entire amount of the original award.

Texas's state allocation in 2012 was $241,296 and dropped to $136,688 in 2014. For FY2015, statement of work plans for the State Clean Diesel Grant Program were due May 13, 2015.

National Clean Diesel Campaign

The National Clean Diesel Campaign is a competitive grant program. Approximately 60 percent of the DERA funding was allocated to this pool of funding from 2008 through 2014. Eligible entities are regional, state, local, or tribal agencies or port authorities with jurisdiction over transportation or air quality and nonprofit organizations or institutions that represent or provide pollution reduction or educational services to persons or organizations that own or operate diesel

fleets, or have as their principle purpose the promotion of transportation or air quality. Non-eligible entities are allowed to partner with an eligible entity that applies for a project.

Projects that have been considered eligible are EPA-verified emission control retrofits, California Air Resources Board-verified emission control retrofits, EPA-verified idle reduction retrofits, incremental cost difference for alternative fuel, EPA-certified alternative fuel conversion kits, EPA-certified engine repowers, and early vehicle/equipment replacements using an EPA-certified engine configuration. Diesel fleet owners and operators can submit project ideas.

The NCDC has sector programs: Clean School Bus, Ports & Marine, Clean Construction, SmartWay Transport, and Clean Agriculture.

In 2014, approximately $10.8 million was allocated to DERA national projects. The Port of Houston received nearly $900,000 to replace 14 older drayage trucks. The North Central Texas Council of Governments (NCTCOG) received over $300,000 to allow the installation of four SmartWay electrified parking spaces. Funding for 2015 is estimated to be $13.5 million.

Emerging Technology Program

The Emerging Technology Program is a competitive grant process to be used by emerging technology manufacturers to implement their technologies on existing diesel fleets that may not yet be commercialized. The funding may not be used for testing. Emerging technology manufacturers must be included on the EPA list, and they must partner with an eligible entity that submits the application.

SmartWay Transport Program

The SmartWay Transport Program reduces transportation-related emissions by creating incentives to improve supply chain fuel efficiency. Key elements are the partnership, technology program, and opportunities for heavy-duty vehicle manufacturers.

The SmartWay Transport Partnership is a partnership in which freight carriers and shippers commit to benchmark operations, track fuel consumption, and improve performance annually in order to help businesses move goods in the cleanest, most efficient way possible. Since 2004, SmartWay partners have eliminated 51.6 million metric tons of CO_2, resulting in savings of 120.7 million barrels of oil and $16.8 billion in fuel costs.

The SmartWay Technology Program is a testing, verification, and designation program to help freight companies identify equipment, technologies, and strategies that save fuel and lower emissions. SmartWay Opportunities for Heavy-Duty Vehicle Manufacturers enables original equipment manufacturers of long-haul tractors and trailers to have their equipment evaluated by EPA to assess whether it meets certain environmental and efficiency specifications established

by SmartWay. SmartWay tries to cover the transportation supply chain and includes SmartWay for Freight Shippers; SmartWay for Truck, Rail and Multimodal Carriers; and SmartWay for Logistics Companies. There is also SmartWay for Countries and for Affiliates and Supporters.

From 2012 through 2014, funding for the Emerging Technology Program and the SmartWay Innovative Finance Program was diverted to establish other federal clean diesel grant programs including a nationwide early school bus replacement program and a program to reduce diesel emissions from off-road diesel engines operating at ports. In July 2015, SmartWay announced Vision 2020, a five-year plan for building on tools and incentives.[5]

Clean School Bus

Clean School Bus is a national program designed to help communities reduce emissions from older diesel school buses.[6] School districts, fleet owners and operators, bus drivers, parents, and students all have a role to play. School buses travel about 4 billion miles each year, and more than 25 million American students ride a school bus every day. These buses provide the safest transportation for getting children to and from school.

All new buses must meet EPA's emission standards, but many older school buses emit harmful diesel exhaust, which has a negative impact on human health and especially on children because they have a faster breathing rate than adults and their lungs are not yet fully developed.

A variety of clean diesel strategies exist for making school buses a cleaner way for children to get to school. One of the easiest ways to reduce school bus emissions and save money is to reduce idling. Another effective method is to replace the oldest school buses in the fleet.

Many organizations are involved in the transportation of schoolchildren. Some are the National School Transportation Association, National Association for Pupil Transportation, National Association of State Directors of Pupil Transportation Services, and American School Bus Council.

School bus programs in Texas are discussed in more detail in the next section of this report.

Clean Diesel Collaboratives

EPA sees reducing diesel emissions as a shared responsibility and collaboration as key. Seven regional collaboratives across the nation take a local approach, provide technical assistance, foster partnerships, and leverage funds to mitigate diesel emissions. The Clean Diesel Collaboratives are public-private partnerships and include EPA regional offices, equipment manufacturers, fleet owners, state and local governments, and nonprofit organizations.

National Vehicle and Fuel Emissions Laboratory

The National Vehicle and Fuel Emissions Laboratory is located in Ann Arbor, Michigan, and is part of OTAQ. NVFEL is at the forefront of developing clean automotive technology and designing programs to reduce and prevent air pollution. NVFEL is a state-of-the-art test facility that provides a wide array of dynamometer and analytical testing and engineering services for EPA's motor vehicle, heavy-duty engine, and non-road engine programs.

Office of Policy (OP)

OP is located in the Office of the Administrator and is the primary policy arm of EPA. OP provides multidisciplinary analytic skills, management support, and special expertise in four areas: regulatory policy and management, environmental economics, strategic environmental management, and sustainable communities. The Office of Policy includes the Office of Sustainable Communities and Climate Change Adaptation Activities among others.[7]

Office of Sustainable Communities

OSC collaborates with other EPA programs; federal agencies; regional, state, and local governments; and a broad array of nongovernmental partners to help communities become stronger, healthier, and more sustainable through smarter growth and green building. This work helps to address the agency's priorities for water and air and the cleaning up of communities. OSC manages the Smart Growth program and the Partnership for Sustainable Communities.

Smart Growth

Land development decisions affect many of the things that touch people's everyday lives—their homes, their health, the schools their children attend, the taxes they pay, their daily commute, the natural environment around them, economic growth in their community, and opportunities to achieve their dreams and goals. These decisions will affect residents' lives for generations to come. Creative strategies are used to develop ways that preserve natural lands and critical environmental areas, protect water and air quality, and reuse land.

OSC sometimes offers grants to support activities that improve the quality of development and protect human health and the environment. Many regions are struggling to balance transportation needs with community revitalization and environmental protection. Infill development can support all three goals. Well-designed, convenient, and accessible neighborhoods make walking, biking, and public transit more appealing. Encouraging infill development may help more people meet their needs with less driving, reducing traffic congestion and improving regional air quality.[8]

3.1.4 National Ambient Air Quality Standards (NAAQS)

In November 2014, EPA proposed revisions to the NAAQS for ground-level ozone,[9] with a final rulemaking scheduled for late 2015. EPA proposed updating the primary ozone standard as well as the secondary standard. The potential impacts of these changes are discussed under the section on the Congestion Mitigation and Air Quality Program.

3.2 Department of Energy

3.2.1 Background

Mitigating greenhouse gas emissions and reducing oil dependence are central to DOE's work. As part of its strategic objectives, DOE is committed "to help the nation achieve an approximately 17 percent reduction in greenhouse gas emissions below 2005 levels by 2020."[10] It intends to accelerate innovation through development of technologies that make energy cleaner and more efficient. Environmentally responsible development includes the capturing of CO_2.

Petroleum use will be decreased by:

- Raising fuel economy standards.
- Gradually electrifying the vehicle fleet.
- Increasing production of advanced biofuels.

Greenhouse gas emissions will be reduced through:

- Improved efficiency.
- Accelerated deployment of low-carbon energy generation technologies (renewable fuels and advanced biofuels made from sustainable resources that can directly substitute for petroleum and use existing infrastructure; and carbon capture and storage).
- Modernization of electrical grid.

DOE has 10 program offices, 16 staff offices, 22 labs and technology centers, and nine field sites to support these initiatives.

3.2.2 Air Quality Improvement Funding Opportunities

The majority of funding opportunities through DOE are found in programs administered by the Office of Energy Efficiency and Renewable Energy (EERE) and its sub-offices: the Vehicle Technologies Office (VTO) and the Vehicle, Bioenergy and Fuel Cell Technologies Offices.

EERE's VTO sponsors the coalition to reduce petroleum use in communities called Clean Cities. EERE's Vehicle, Bioenergy, and Fuel Cell Technologies Offices administer the Sustainable

Transportation Program. EERE administered the Energy Efficiency and Conservation Block Grant (EECBG) Program. EERE is assisted by the National Renewable Energy Laboratory (NREL), as shown in the DOE's funding framework in Table 3.

Table 3. Department of Energy Funding Framework for Air Quality Improvement.

<table>
<tr><th colspan="4">DEPARTMENT OF ENERGY</th></tr>
<tr><td rowspan="3">Responsible Offices</td><td colspan="3">Office of Energy Efficiency and Renewable Energy</td></tr>
<tr><td colspan="2">Vehicle Technologies Office</td><td rowspan="2">Energy Efficiency and Conservation Block Grant Program</td></tr>
<tr><td></td><td>Vehicle, Bioenergy and Fuel Cell Technologies Offices</td></tr>
<tr><td>Programs</td><td>Clean Cities</td><td>Sustainable Transportation</td><td></td></tr>
<tr><td>Supporting</td><td colspan="3">NREL</td></tr>
</table>

Office of Energy Efficiency and Renewable Energy

EERE works with businesses, industries, universities, and others to increase the use of renewable energy and energy efficiency technologies. Renewable energy technologies include biofuels (from biomass); geothermal, hydrogen, and fuel cell technologies; and hydropower, ocean, solar, and wind energy. EERE also addresses advanced vehicle technology.

EERE encourages the growth of these technologies by offering financial assistance for its development and demonstration. Funding opportunities are announced through the grant.gov website and the EERE Exchange System.[11]

As part of its Lab Impact Initiative, DOE announced in July 2015 the competitive selection of five Energy Department National Laboratories to lead the $20 million pilot, including Oak Ridge National Laboratory ($5.6 million), National Renewable Energy Laboratory ($4.9 million), Lawrence Berkeley National Laboratory ($4.2 million), Sandia National Laboratories ($2.8 million), and Pacific Northwest National Laboratory ($2.7 million).

The labs will focus on assisting small businesses developing specific clean energy technologies in the areas of advanced manufacturing, buildings, vehicles, wind, water, bioenergy, fuel cells, geothermal, and solar. In addition to providing vouchers to small businesses, lead labs will also be responsible for outreach, merit review coordination, and matchmaking between businesses and experts. Other labs can also fulfill vouchers with small businesses.

Vehicle Technologies Office

VTO is developing more energy-efficient and environmentally friendly highway transportation technologies that will enable the United States to use less petroleum. The long-term aim is to develop leap frog technologies that will provide Americans with greater freedom of mobility and energy security while lowering costs and reducing impacts on the environment.[12]

Some VTO program areas are hybrid and vehicle systems, energy storage, power electronics and electrical machines, advanced combustion engines, fuels and lubricants, material technologies, EPA transportation regulatory activities, Clean Cities, and research partnerships.

In 2014, DOE announced more than $55 million for 31 new projects to accelerate research and development of critical vehicle technologies that will improve fuel efficiency and reduce costs.

Clean Cities

The Clean Cities Program dates back to the Alternative Motor Fuels Act of 1988 and the Clean Air Act Amendments of 1990. These laws encouraged the production and use of alternative fuel vehicles (AFVs) and the reduction of vehicle emissions and led to the creation of the Alternative Fuels Data Center (AFDC) in 1991 to collect, analyze, and distribute data.

In 1992, the enactment of the Energy Policy Act of 1992 (EPAct) required certain vehicle fleets to acquire AFVs. Subsequently, DOE created the Clean Cities Program in 1993 to provide informational, technical, and financial resources to EPAct-regulated fleets and voluntary adopters of alternative fuels and vehicles.

Clean Cities continues to support local actions to reduce petroleum use in transportation. Almost 14,000 stakeholders participate in nearly 100 coalitions across the country. Private companies, fuel suppliers, vehicle fleets, local governments, vehicle manufacturers, national laboratories, state and federal government agencies, community organizations, and others join together to implement alternative transportation solutions in their communities.

Clean Cities reduces petroleum use by deploying technologies in ways that address specific regional/local needs:

- Alternative fuels: electric drive, natural gas, propane.
- Renewable fuels: renewable natural gas/biomethane, ethanol/E85, biodiesel/B20 and higher.
- Fuel economy efforts: smarter vehicle purchasing and driving habits.
- Idle reduction: for trucks, buses, and municipal vehicles.
- Other emerging fuels, technologies, niche markets: hydrogen, fuel cells, etc., as they become market ready and additional niche markets emerge.

Local coalitions identify funding and financial opportunities; develop information resources; reach out to large fleets; provide technical assistance to fleets deploying alternative fuels, advanced vehicles, and idle reduction; analyze data from industry partners and fleets to develop tools and information for the AFDC; and work with industry partners and fleets to identify and address technology barriers.

Since 1993, Clean Cities has distributed $376 million in project awards, which have leveraged an additional $740 million in matching funds and in-kind contributions from other sources.

In 2015, Clean Cities distributed 11 alternative fuel project awards totaling $6 million. These projects aim to improve potential buyers' experiences with alternative fuel and plug-in electric vehicles, support training, and integrate alternative fuels into emergency planning.

The Clean Cities Program received funds from the American Recovery and Reinvestment Act through 25 cost-share projects. The North Central Texas Council of Governments received over $13 million as part of the North Central Texas Alternative Fuel and Advanced Technology project. There is also a Houston-Galveston Clean City Coalition.[13]

Sustainable Transportation[14]

EERE aims to make transportation cleaner and more efficient through solutions that put electric drive vehicles on the road and replace oil with clean domestic fuels. EERE's Vehicle, Bioenergy, and Fuel Cell Technologies Offices advance the development of next-generation technologies to improve plug-in electric and other alternative fuel vehicles, advance combustion engine and vehicle efficiency, and produce low-carbon domestic transportation fuels.

The development and deployment of advanced vehicle technologies includes advances in electric vehicles, engine efficiency, and lightweight materials. The cost of producing electric vehicle batteries has decreased by more than 35 percent since 2008. Better combustion engines have saved billions of gallons of fuel, while making diesel vehicles cleaner.

VTO develops and deploys efficient and environmentally friendly technologies, including:

- Batteries and energy storage—address energy storage challenges including cost, performance, life, and abuse tolerance.
- Advanced combustion engines—improve efficiency of internal combustion engines.
- Hybrid and vehicle systems—perform research and development (R&D) to improve vehicle efficiencies.
- Power electronics and electrical machines—develop highly reliable, efficient, and rugged technologies for advanced electric drive vehicles.

- Fuels and lubricants—provide cost-competitive fuel options with high fuel economy and low emissions.
- Material technologies—develop advanced materials to boost the fuel economy.

The Bioenergy Technologies Office (BTO) guides research, development, and demonstration to help develop sustainable and cost-competitive biofuels, bioproducts, and biopower. The cost of non-food-based ethanol has reduced more than $6 per gallon since 2001. It is now projected to be cost competitive with gasoline when ramped up to a commercial scale. Twenty-five new biorefineries are being built in the United States. Drop-in biofuels are being developed to take advantage of existing infrastructure by providing nearly identical biobased substitutes (crude oil, gasoline, diesel fuel, and jet fuel). Advances to reduce costs and establish best practices for harvesting, handling, and preprocessing a variety of crops for energy production are next.

BTO focuses on forming cost-share partnerships with key stakeholders to develop, demonstrate, and deploy technologies for advanced biofuel production from lignocellulose and algal biomass. Examples include:

- Processing and conversion—develop technologies to efficiently convert feedstocks into transportation fuels, bioproducts, and biopower.
- Algal biofuels—break down technical barriers and promote sustainable, affordable, and scalable algae-based biofuels.
- Biorefinery projects—fund biorefinery projects from the pilot to commercialization.
- Analysis—apply analytical tools, data, and methodologies to identify research and development pathways that offer the greatest potential for commercialization.
- Feedstock supply—identify and develop efficient, sustainable, renewable, biological materials for the production of clean energy.
- Sustainability—ensure that efforts to develop bioenergy do not compromise environmental quality or the availability of food, fiber, and water.
- Feedstock logistics—design and develop equipment and systems to reduce cost, improve biomass quality, and increase productivity throughout the logistics chain.
- Biopower—increase use of biomass to generate electricity, heat, and power.

The Fuel Cell Technologies Office (FCTO) leads applied R&D of cutting-edge hydrogen and fuel cell technologies and supports R&D that makes it cheaper and easier to produce, deliver, and store hydrogen, while also working to lower the costs of fuel cells and improve their durability and performance. Manufacturing costs for automotive fuel cells have decreased by more than 80 percent since 2002, while doubling their durability.

FCTO addresses the full range of barriers facing the development and deployment of innovative hydrogen and fuel cell technologies to decrease U.S. dependence on oil, reduce carbon emissions, and enable clean, reliable power generation. These include:

- Hydrogen production—produce hydrogen from domestic resources while minimizing environmental impacts and decreasing costs.
- Hydrogen delivery—deliver hydrogen from centralized or distributed sites safely and efficiently.
- Hydrogen storage—store hydrogen while ensuring that fuel cell electric vehicles and systems meet customer performance expectations.
- Fuel cells—convert hydrogen to electrical or thermal power for vehicles or other applications, including electricity for buildings.
- Manufacturing—develop processes and technologies that reduce the costs of manufacturing fuel cell components and systems enabling a domestic industry.
- Systems analysis—develop methodologies and resources to understand the complex interactions between components, systems, costs, energy efficiency, environmental impacts, societal impacts, and system tradeoffs.
- Technology validation—test advanced technologies and innovative solutions through system validations in real-world environments.
- Market transformation—accelerate commercialization and promote early adoption of hydrogen and fuel cell technologies.

Energy Efficiency and Conservation Block Grant

The EECBG Program through the American Recovery and Reinvestment Act (2009) provided $3.2 billion in block grants to cities, communities, states, U.S. territories, and Indian tribes. These grants were to develop, promote, implement, and manage energy efficiency and conservation projects that ultimately created jobs. The goal was to rapidly increase the number of communities directly engaged in programs that increased renewable energy capacity, technical knowledge, and deployment of energy efficiency projects at the local level.

Approximately $2.7 billion was awarded through formula grants and approximately $454 million was allocated through competitive grants awarded through DOE. Up to October 2013, transportation received $116.46 million and reduction/capture of methane/greenhouse gases received $30.42 million.[15]

National Renewable Energy Laboratory

NREL is DOE's primary national laboratory for renewable energy and energy efficiency research and development. NREL develops renewable energy and energy efficiency technologies

and practices, advances science and engineering, and transfers knowledge and innovations. NREL's emphasis is on an energy approach that encompasses the following key systems:

- Fuel production.
- Transportation.
- The built environment.
- Electricity generation and delivery.

The laboratory is managed for EERE by the Alliance for Sustainable Energy, LLC, a partnership between Battelle and MRIGlobal. NREL also conducts research for DOE's Office of Science and Office of Electricity Delivery and Energy Reliability. NREL partners with private industry, academia, and government. NREL's funding was over $360 million in 2014.[16]

3.3 Multiagency Programs

3.3.1 Background

There are a number of multiagency programs where transportation air quality improvements play a role. Two important programs are the Sustainable Communities Partnership (EPA, USDOT, HUD) and the U.S. Climate Change Technology Program (EPA, DOE, DOC, DOD, DOI, HHS, NASA, NSF, USAID, USDA), which are the responsibility of the offices participating in these programs.

3.3.2 Air Quality Improvement Funding Opportunities

Transportation air quality improvement funding opportunities for multiagency programs are part of the budgets of the different participating agencies.

Partnership for Sustainable Communities

Sustainable communities are places that have a variety of housing and transport choices, with destinations close to home. Sustainable communities are defined by the partnership as those that have lower transportation costs, reduced air pollution and stormwater runoff, and decreased infrastructure costs; preserve historic properties and sensitive lands; save people time in traffic; are more economically resilient; and meet market demand for different types of housing.

In 2009, the U.S. Department of Housing and Urban Development (HUD), USDOT, and EPA joined together to help communities nationwide improve access to affordable housing, increase transportation options, and lower transportation costs while protecting the environment. The partnership works to coordinate federal housing, transportation, water, and other infrastructure investments to make neighborhoods more prosperous, allow people to live closer to jobs, save households time and money, and reduce pollution.

The partnership agencies incorporate six principles of livability into federal funding programs, policies, and future legislative proposals:

- Provide more transportation choices. Develop safe, reliable, and economical transportation choices to decrease household transportation costs, reduce the nation's dependence on foreign oil, improve air quality, reduce greenhouse gas emissions, and promote public health.
- Promote equitable, affordable housing. Expand location- and energy-efficient housing choices for people of all ages, incomes, races, and ethnicities to increase mobility and lower the combined cost of housing and transportation.
- Enhance economic competitiveness. Improve economic competitiveness through reliable and timely access to employment centers, educational opportunities, services, and other basic needs by workers, as well as expanded business access to markets.
- Support existing communities. Target federal funding toward existing communities—through strategies like transit-oriented, mixed-use development and land recycling—to increase community revitalization and the efficiency of public works investments and safeguard rural landscapes.
- Coordinate and leverage federal policies and investment. Align federal policies and funding to remove barriers to collaboration, leverage funding, and increase the accountability and effectiveness of all levels of government to plan for future growth, including making smart energy choices such as locally generated renewable energy.
- Value communities and neighborhoods. Enhance the unique characteristics of all communities by investing in healthy, safe, and walkable neighborhoods.

Since forming the Partnership for Sustainable Communities, HUD, USDOT, and EPA have announced a series of grants and other assistance to communities across the country. Although Texas has received partnership funding, the project maps indicate more partnership programs to states in the eastern part and especially the western part of the country.[17]

U.S. Climate Change Technology Program (CCTP)

CCTP is a multiagency planning and coordination activity led by DOE that organizes and supports an associated portfolio of federal R&D. It was established under the Committee on Climate Change Science and Technology Integration in 2003 and subsequently authorized in the Energy Policy Act of 2005.

CCTP's vision is to attain, on a global scale and in partnership with others, a technological capability that can provide abundant, clean, secure, and affordable energy and other services needed to encourage and sustain economic growth, while simultaneously achieving substantial reductions in emissions of GHGs and mitigating the potential risks of climate change and

increasing GHG concentrations. CCTP's mission is to stimulate and strengthen the scientific and technological enterprise of the United States through improved coordination and prioritization of multiagency federal climate change technology R&D programs and investments, and to provide global leadership, in partnership with others, aimed at accelerating development and facilitating adoption of technologies that can attain the CCTP vision.

Member agencies of the U.S. Climate Change Technology Program, as well as selected examples of climate-change-related technology R&D, are:

- Department of Agriculture—Carbon fluxes in soils, forests, and other vegetation; carbon sequestration; nutrient management; cropping systems; forest and forest products management; livestock and waste management; biomass energy and biobased product development.
- Department of Commerce including National Institute of Standards and Technology, International Trade Administration, National Oceanic and Atmospheric Administration—Instrumentation, standards, ocean sequestration, decision support tools.
- Department of Defense—Aircraft, engines, fuels, trucks, equipment, power, fuel cells, lasers, energy management, basic research.
- Department of Energy—Energy efficiency, renewable energy, nuclear fission and fusion, fossil fuels and power, carbon sequestration, basic energy sciences, hydrogen, electric grid and infrastructure.
- Department of Health and Human Services including National Institutes of Health—Environmental sciences, biotechnology, genome sequencing, health effects.
- Department of the Interior—Land, forest, and prairie management; mining; sequestration; geothermal; terrestrial sequestration technology development.
- Department of State including U.S. Agency for International Development—International science and technology cooperation, oceans, environment international assistance, technology deployment, land use, human impacts.
- Department of Transportation—Aviation, highways, rail, freight, maritime, urban mass transit, transportation systems, efficiency, safety.
- Environmental Protection Agency—CO_2 and non-CO_2 GHG emission mitigation through voluntary partnership programs including Energy STAR, climate leaders, green power, combined heat and power, state and local clean energy, methane and high global warming potential gases, and transportation; GHG emissions inventory.
- National Aeronautics and Space Administration:
  - Earth observations; measuring and monitoring aviation equipment; operations and infrastructure efficiency.

- Geosciences, oceans, nanoscale science and engineering, computational sciences.
- Potential reduction of CO_2 emissions and CO_2 concentration growth in atmosphere via technologies and improved management systems for carbon dioxide capture, storage, and sequestration.

In an analysis of the federal climate change funding from FY2008 to FY2014,[18] it was found that 68 percent ($7.9 billion) of the climate-change-related budget was allocated to clean energy technologies. This budget authority covered programs from the federal agencies that participate in the program. Bench scale research capability in the clean energy area is a requirement.[19]

3.4 Organizations and Associations

A large number of organizations provide information and represent their members, which may be of relevance to Texas agencies looking to fund transportation-related air quality improvement projects. Some examples are discussed next.

3.4.1 Manufacturers of Emission Controls Association (MECA)

MECA is a nonprofit association that was formed in 1976 to provide technical information on emission control technology for motor vehicles. MECA's mission expanded as the emission control industry grew. Today, MECA's members include leading manufacturers of a variety of emission control equipment for automobiles, trucks, and buses; off-road vehicles; and stationary sources. MECA's mission is to provide technical information on emission controls, thereby facilitating the establishment of a strong and effective state, national, and international air quality policy that promotes public health, environmental quality, and industrial progress.[20]

3.4.2 National Gas Vehicles for AMERICA (NGVAmerica)

NGVAmerica is a national organization dedicated to the development of a growing, profitable, and sustainable market for vehicles powered by natural gas or biomethane. NGVAmerica represents more than 200 companies, environmental groups, and government organizations interested in the promotion and use of natural gas and biomethane as transportation fuels. Member companies are those that produce, distribute, and market natural gas and biomethane across the country; manufacture and service natural gas vehicles, engines, and equipment; and operate fleets powered by clean-burning gaseous fuels.[21]

3.4.3 Associated General Contractors of America (AGC)

AGC, established in 1918, is the leading association for the construction industry. Operating in partnership with its nationwide network of 95 chartered chapters, AGC provides a full range of services satisfying the needs and concerns of its members, thereby improving the quality of construction and protecting the public interest. A full-service national trade association with a nationwide network of chapters, AGC represents more than 25,000 firms in the industry—

including general contractors, specialty contractors, and service providers and suppliers. AGC members play a powerful role in sustaining economic growth, in addition to producing structures that add to productivity and the nation's quality of life.[22]

3.5 Texas-Specific Entities

There are several organizations in Texas that play a role in the transportation air quality landscape and are involved in air quality funding opportunities as receivers and/or funders. Additional organizations provide education and information resources but do not normally fund research, planning, or implementation. Some examples of agencies and organizations that do regularly fund such activities are described below.

3.5.1 Texas Commission on Environmental Quality

TCEQ is the environmental agency for the state. TCEQ has approximately 2,767 employees, 16 regional offices, and a $379 million operating budget for the 2014 fiscal year. TCEQ strives to protect Texas's public health and natural resources consistent with sustainable economic development. The goal is clean air, clean water, and safe waste management. TCEQ, in cooperation with EPA and USDOT, administers the program that monitors air quality across the state and plans to meet standards where they have been found not to comply with federal standards.[23] In addition to developing the state implementation plan (SIP) to achieve federal standards, TCEQ has several programs to support plan implementation, as described below.

3.5.2 Office of Air—Air Quality Division

The Air Quality Division works to protect and restore air quality through four programs.

- Air Implementation Grants.
- Air Industrial Emissions Assessment.
- Air Modeling and Data Analysis.
- Air Quality Planning.

3.5.3 Texas Emissions Reduction Plan (TERP)

TERP was established by the 77th Texas Legislature in 2001. TERP includes a number of voluntary financial incentive programs, as well as other assistance programs, to help improve air quality and address the goals of the plan:

- Emissions Reduction Incentive Grants Program (ERIG)—This program provides grants to eligible projects in affected counties to offset the incremental cost associated with the activities to reduce emissions of nitrogen (NO_x) from high-emitting mobile diesel sources in nonattainment areas and other affected counties of the state.

- Rebate Grants Program—This program is a simplified application process under ERIG. Rebate grants are only available for diesel on-road and non-road replacement and repower projects. Part of the funds allocated to the Rebate Grants Program are set aside for applications from entities that qualify as a small business under TERP.
- ARRA Rebate Grants Program—This program is a simplified first-come, first-serve grant program to upgrade or replace heavy-duty vehicles and/or non-road equipment. On-road replacement vehicles may be powered by diesel, natural gas, or propane. Non-road projects may only replace a diesel engine with a diesel engine.
- Texas Clean Fleet Program—This program offers grants to replace heavy-duty and light-duty on-road diesel vehicles with alternative fuel and hybrid vehicles.
- New Technology Research and Development Program—This program provides financial incentives to encourage and support research, development, and commercialization of technologies that reduce pollution in Texas through the issuance of state-funded grants.
- New Technology Implementation Grants Program—The primary purpose of this grant program is to offset the incremental cost of emission/pollutant reductions from facilities and other stationary sources in Texas.
- Clean School Bus Program—This program funds projects to help reduce the exposure of school children to diesel exhaust from school buses. Projects may include diesel oxidation catalysts, diesel particulate filters, and emissions-reducing add-on equipment.
- Heavy-Duty Motor Vehicle Purchase or Lease Incentive Program—This is a statewide program administered by TCEQ. TCEQ may reimburse a purchaser or lessee of a new on-road heavy-duty (over 10,000 lb) vehicle for incremental costs of purchasing or leasing the vehicle in lieu of a higher-emitting diesel-powered vehicle.
- Light-Duty Motor Vehicle Purchase or Lease Incentive Program—This is a statewide program to provide financial incentives (rebates) for the purchase or lease of an eligible new car or light truck, model year 2003 or newer.

3.5.4 Metropolitan Planning Organizations

There are 25 MPOs in Texas.[24] An MPO is required for each urban area with a population of more than 50,000 people. MPOs are the local decision-making bodies that are responsible for overseeing the metropolitan transportation planning process. In cooperation with TxDOT and TCEQ, they address air quality issues and develop necessary programs to achieve needed transportation-related air quality improvements. Programs are more or less extensive depending on the number of people within the MPO and whether there are nonattainment counties in its jurisdiction. Most funding originates from federal and state sources, but limited local funds may also be made available. NCTCOG is an example serving the Dallas and Fort Worth areas.

North Central Texas Council of Governments

NCTCOG serves as the MPO for a 16-county region centered around the two urban centers of Dallas and Fort Worth as well as being that area's council of governments (COG). NCTCOG is a voluntary association of, by, and for local governments and was established to assist local governments in planning for common needs, cooperating for mutual benefit, and coordinating for sound regional development. NCTCOG's purpose is to strengthen both the individual and collective power of local governments and to help them recognize regional opportunities, eliminate unnecessary duplication, and make joint decisions. NCTCOG has over 230 member governments including 16 counties, numerous cities, school districts, and special districts.[25]

Each member government appoints a COG voting representative from its governing body. These voting representatives make up the general assembly, which annually elects the executive board composed of 13 locally elected officials. It is the policy-making body for all activities undertaken by the council of governments, including program activities and decisions, regional plans, and fiscal and budgetary policies. The board is supported by technical, study, and policy development committees and a professional staff.

In 2012, EPA designated 10 counties (Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwall, Tarrant, and Wise Counties) in North Central Texas as nonattainment for the pollutant ozone in accordance with the 1997 eight-hour ozone NAAQS. This continued the region's designation as a nonattainment area, although boundaries have been adjusted over time.

As an MPO, NCTCOG develops a plan for the nonattainment area to reduce transportation-related emissions so the area can meet air quality standards. This becomes part of the Texas SIP to meet air quality standards throughout Texas. The plan is developed in partnership with local agencies and with TCEQ and TxDOT. Funding to implement the emission reduction actions in the plan comes from sources previously described plus local funding.

The SIP for the Dallas–Fort Worth nonattainment area includes programs to get older cars off the road, technologies to clean up vehicles already on the road, and education programs so that citizens can do their part in improving air quality in North Texas. Programs include:

- General Programs:
  - Air North Texas.
  - ARRA Projects.
  - Clean Cities Coalition.
  - Clean Fleet Vehicle Call for Projects.
  - Clean Fleet Vehicle Policy.
  - Light-Emitting Diode Traffic Signal Replacement Program.
  - Regulated Fleets Program/North Texas Green and Go.

  - SmartWay Program.
- Heavy-Duty Vehicle and Equipment Programs:
  - Blue Skyways Collaborative.
  - Construction Fleets.
  - Diesel Idling Reduction Program.
  - Heavy-Duty Vehicle and Equipment Grant Program.
  - Locally Enforced Idling Restrictions.
  - North Central Texas Clean School Bus Program.
  - North Texas Emissions Reduction Grant Program.
  - Regional Refuse Hauler Program.
  - TERP.
- Light-Duty Vehicle Programs:
  - Electric Vehicles North Texas.
  - North Texas Green and Go Partnership.
  - Parking Cash-Out Pilot Program.
  - Pay-As-You-Drive Automobile Insurance Pilot Program.
  - Try Parking It.
- Inspection and Maintenance and High-Emitting Vehicle Programs:
  - AirCheckTexas Drive A Clean Machine Program.
  - Car Care Clinics.
  - College and University Inspection and Maintenance Partnership Program.
  - Heavy-Duty Diesel Inspection and Maintenance Pilot Program.
  - Enhanced Remote Sensing Performance Based Pilot Program.
  - High-Emitting Vehicle Program.
  - NCTCOG Emissions Database.
  - Regional Emissions Enforcement Program.
  - Regional Smoking Vehicle Program.
- Other Resources:
  - Electric Vehicle and Bike Sharing Programs.

The NCTCOG SIP also includes improvements to the transportation system that are projected to reduce emissions. These may be transportation control measures (TCMs) that are legally enforceable, voluntary improvements or other improvements that could benefit air quality not part of the SIP. These improvements are normally funded with conventional funding.

3.5.6 North Texas Commission (NTC)

North Texas is the home of more than 6 million people and is the fourth largest metro region in the United States with 12 counties, 135 municipalities (13 of which have a population of more

than 100,000), and a labor force of 3.5 million. NTC collaborates with regional stakeholders to strengthen public-private alliances, advancing an economically vibrant region.

The Clean Air Texas Initiative, born out of the merger of the North Texas Clean Air Coalition and Texas Business for Clean Air, works with the business community of North Texas to develop and implement voluntary strategies for improving air quality within that region.

NTC is a part of the North Texas Clean Air Steering Committee, a regional advocacy coalition of business and civic leaders formed in 1999, to formulate strategies in the state implementation plan to reduce emissions that pollute the air, cause health problems, and jeopardize the region's mobility and economic vitality.

NTC continues to host the Working for Clean Air Awards, created a Clean Fleet Certification Program, and works with regional partners such as Air North Texas and the council of governments on their air quality campaigns.[26]

3.5.7 Texas Association of School Boards (TASB)

TASB was created in 1949 as a voluntary, nonprofit, statewide educational association that serves and represents local Texas school districts. Membership includes all 1,030 Texas school districts, 20 regional education service centers, 50 community colleges, 16 tax appraisal districts, and 137 shared service arrangements. The association represents the largest group of publicly elected officials in the state (more than 7,000 school board members) that serves over 4.9 million Texas students.[27] Texas has more than 35,000 school buses, most of which are diesel powered. Many are old and high emitters.[28] TASB was part of a coalition that sought legislative support in form of the Clean Cities Program to help schools retrofit or replace aging diesel school buses to reduce emissions.

3.5.8 Clean Air Force of Central Texas

In the mid-eighties, several entities in the Austin area were initiating programs to improve air quality and prevent Central Texas from being designated as nonattainment for ground-level ozone. The area exceeded in 1985 the then ozone standard.

Recognizing the detrimental health, economic, and quality-of-life impacts of deteriorating air quality, groups such as the Greater Austin Chamber of Commerce, the Capital Area Metropolitan Planning Organization (CAMPO), the City of Austin, the TxDOT Austin District, the American Lung Association, and other area business and community leaders saw the need to coordinate among themselves to (a) provide a more effective air quality improvement message, and (b) launch and finance much-needed technical studies. In 1993, representatives from these organizations joined to form Clean Air Metro Austin, the core of what is currently the Clean Air Force Technical Advisory Committee (TAC).

Since 1993, membership in TAC has expanded to include representatives from businesses, local governments, environmental groups, neighborhood associations, and public interest groups, as well as local citizens concerned about air quality. TAC members are experts in the air quality industry. In 1994, Clean Air Metro Austin became the Austin Air Force and applied for incorporation as a 501(c)(3) nonprofit corporation. The organization was renamed the Clean Air Force of Central Texas in early 1996 to reflect the regional nature of air quality issues.

The mission of the Clean Air Force of Central Texas is to (a) be a liaison among all stakeholders, (b) coordinate the air quality planning of the private sector, (c) provide a forum for public discussion, (d) educate the public on air quality issues, and (e) manage air quality improvement programs in Central Texas focused on motivating the citizens, businesses, and governments of the region to take actions to reduce air pollution to protect public and economic health.

The Clean Air Partners Program works with local employers to design company-specific emission reduction strategies. There are approximately 100 partners in the five-county Austin–Round Rock Metropolitan Area (Bastrop, Caldwell, Hays, Travis, and Williamson Counties) implementing programs and reporting their reductions. The Ozone Alert Program informs and educates Central Texans of days when the region's air quality is likely to reach unhealthy levels via a free email notification service, through an information hotline, and via Facebook and Twitter.

The Clean School Bus Program focuses on reducing children's exposure to harmful pollutants. The program works with local independent school districts (ISDs) to retrofit and replace older school buses and implement anti-idling programs.

The High School Public Service Announcement Air Quality Contest engages local youth in air quality research and education. The Electric Lawn Equipment Discount Program takes place each spring and provides citizens with significant discounts on electric lawn equipment.[29]

3.6 Summary of Preliminary Findings

The review shows that many entities are involved in air quality, i.e., funders, those needing funding, manufacturers, and associations promoting their point of view or interests. Specific agencies have funding programs aligned with their major areas of interest.

The main preliminary findings from looking at the EPA, DOE, and multiagency partnerships and Texas-specific programs indicated the following:

- EPA's focus, through its various entities and offices, ranges from greenhouse gas emissions reductions, to clean diesel programs, to sustainable communities. However,

it is seen that heavy-duty diesel emissions reduction continues to be a big focus area for EPA from a transportation-sector perspective.

- DOE, in contrast, tends to have a broader focus, on energy efficiency and alternative fuels and advanced technologies. Notable programs include the Clean Cities Program and the Sustainable Transportation Program.
- Multiagency partnerships, such as those in the area of health and transportation and sustainable transportation, could potentially be leveraged for air quality funding opportunities.
- In Texas, the TERP Program will continue to be an important source of transportation air quality funding.

The Clean School Bus Program and initiatives under health and transportation were identified as potential growth areas and are discussed in detail in latter sections of this report. Additionally, the CMAQ Program is an important and well-known source of transportation air quality funding. Though the initial study (conducted in FY2014) did not discuss the CMAQ Program in detail, a section focusing on the CMAQ Program was added, keeping in mind the needs of potential new nonattainment areas (in light of the anticipated ozone NAAQS revision).

4. CLEAN SCHOOL BUS PROJECTS

Clean school bus projects in Texas have attracted state, local, and federal funding. The majority of state funding comes from specific allocations from TERP and competitive grants from TERP's ERIG Program. The majority of federal funding comes through the CMAQ Program in ozone nonattainment areas and from competitive clean air grants from EPA.

4.1 Texas Clean School Bus Program

A review of Texas's Clean School Bus Program[30] completed in 2012 by the Environmental Defense Fund (EDF) found that over 770,000 children (about half of children relying on buses for transportation in Texas) are still riding in dirty buses (six years and older). The number of dirty buses was estimated to be nearly 17,700.

Many school buses are powered by older diesel engines that emit from the tailpipe and the crankcase. Emissions affect students both inside and outside the bus. New buses are over 50 times cleaner than 1988 models (and older) for NO_x and 60 times cleaner for particulate matter (PM).

The World Health Organization in 2012 noted a causal link between exposure to diesel exhaust and lung cancer. EPA is concerned especially with the smallest size particular matter (2.5 microns and smaller) because they are more easily respired by people and are known to aggravate asthma, cause lung inflammation, lead to heart problems, and increase the risk of cancer. Children are especially susceptible to damaging pollutants because their bodies are still maturing. The faster rate of respiration, in combination with undeveloped lungs, makes children more vulnerable to airborne toxins.[31]

In 2005, TCEQ got the authorization to develop a statewide program to support clean school bus retrofit projects. Regional school bus retrofit programs are run in the Houston-Galveston-Brazoria, Dallas–Fort Worth, San Antonio, Central Texas, and Alamo area by government and area councils and the Clean Air Force of Texas. Some school districts have found their own means to reduce emissions by leveraging programs targeting general diesel emissions reductions.

The options available to achieve emissions reductions from school buses considered were replacement of vehicles, retrofits, idle reduction, and routing improvements.

Through the end of the 2011 calendar year, 7,068 buses had been retrofitted and 700 buses had been replaced in Texas. The average cost per bus was $30,113 for replacement and $2,589 for retrofits.

Around the United States, different funding sources are used, including state vehicle title transfer fees and levying taxes, legislative appropriation, CMAQ funds, environmental fines, federal grants awarded through EPA (DERA) and through DOE's Clean Cities Program, and private donations.

In Texas, the majority of funding comes from the state ($24.5 million) through TERP and competitive grants that some school districts have pursued through TERP's ERIG Program. Supplemental environmental project (SEP) penalties are also used. The majority of federal funding ($19.5 million) has come from CMAQ funding to the state's nonattainment areas (Houston, Dallas).

The TCEQ Clean School Bus Program moved nearly $7 million back to the TERP Program,[32] suggesting that at least at that time, there was a decreased demand for retrofit projects by school districts.

The obstacles that have impeded many fleets to retrofit or replace buses include lack of funding, procedural difficulties, and technological challenges. In particular, the EDF recommended the following:

- Continue to educate and motivate school districts to take advantage of available funding.
- Make more funding available for clean school bus projects, especially replacements.
- Target outreach to school districts, especially in rural areas.

EDF reports and videos on school bus emissions have been helpful[33] to raise awareness. Making people aware of options is beneficial. Some MPOs continue to use SEP funds with CMAQ funds. Emission standards can be written into the contract language for private school bus fleets. Occupational health and emission exposure concerns make the usefulness of clean school bus projects clearer. Better characterization of school bus emissions would help with fund allocation decisions.

4.2 EPA's School Bus Replacement Rebate Program

In 2012, nearly 1,000 school bus fleets applied for EPA's School Bus Replacement Rebate Program[34] (part of the National Clean Diesel Campaign), requesting $70 million. Only $2 million was allocated (below 3 percent of the expressed need).

In 2014, over 500 school bus fleets applied, requesting over $32 million in funding. This time, $3 million was allocated to the program, and EPA Region 1, 6, and 7 provided additional resources. It seems that school districts had been discouraged to apply (only half the number applied in 2014 compared to 2012) because of the small chance of success.

In 2012 as well as in 2014, all applicants were given identification numbers and randomly selected and placed in order on a list. Starting at the top of the list, funds were reserved for applicants until the total allocation was used. Others were placed on an applicant wait list.

In 2014, 76 fleet owners could replace 200 older diesel school buses. Two schools in Texas were on this list. The Spring Branch Independent School District was sixth on the list, and the Aldine Independent School District (#56) was selected to receive funding provided be EPA Regions 1, 6, and 7. When replacing buses, school districts have nine months to order new buses, scrap the old ones, and submit all paperwork to EPA.

In 2014, Texas had five schools on the applicant wait list of 472 (Texas Serenity Academy Charter School, #71; Danbury ISD, #161; Socorro ISD, #356; Granbury ISD, #433; and Fort Worth ISD, #463). In 2012, Texas had 28 school districts on the wait list.

Adding those successful to those on the wait list means that seven school districts in Texas applied (less than 2 percent of applicants) to the EPA's School Bus Replacement Rebate Program in 2014, as shown Table 4. In 2004, Texas's school bus fleet (33,376) represented over 7 percent of the total U.S. school bus fleet (458,229).[35]

Table 4. Overview of EPA's School Bus Replacement Rebate Program.

Year	No. of Applicants	Total Requested (Million)	Total Allocated (Million)	No. of Successful Applicants	No. of Applicants from Texas	No. of Successful Applicants from Texas
2012	999	70	2	28	28	0
2014	548	32	3*	76	7	2

Note: Additional money provided by EPA Regions 1, 6, and 7.

According to a report done for the Union of Concerned Scientist in 2002, Texas had approximately 2,000 alternative fueled school buses.[36]

4.3 Summary

As of 2012, Texas has achieved real improvements in air quality on school buses thanks to federal, state, and regional programs. Nevertheless, over 770,000 students continued to ride in dirty buses at that time. School districts were found to need education and motivation to take advantage of available funding. Especially rural school districts required outreach. Red tape and procedural issues, as well as technology challenges, were found to impede progress in Texas. Existing programs could be adjusted to make more funding available. At the same time, MPOs

and others have continued since 2012 to use innovative ways to direct funds to clean school bus projects.

Only a few school districts in Texas have tried to obtain funding for cost-effective emission reduction strategies from EPA programs. In 2014, only six school districts applied for funding from EPA's School Bus Replacement Rebate Program. The Texas Education Agency[37] oversaw 1,247 public school districts, open enrollment charter schools, juvenile justice districts, and specialty schools in 2014. The TCEQ Clean School Bus Program moved nearly $7 million back into the TERP Program in 2011, suggesting a decreased demand for retrofit projects at that time.

The majority of federal funding (approximately $20 million) for clean school bus projects has come from CMAQ funding to the state's ozone nonattainment areas and competitive clean air grants from EPA (DERA, Blue Skyways).

5. HEALTH AND TRANSPORTATION

The relationship between transportation and the physical, social, and mental health of communities is increasingly being recognized. The area of health and transportation is gaining importance in the transportation sector and has grown to be of significant interest in current and emerging research. One element is the integration of health into transportation planning. Two papers written by the National Transportation Systems Center (Volpe) for the Federal Highway Administration (FHWA), titled *Metropolitan Area Transportation Planning for Healthy Communities*[38] and *Statewide Transportation Planning for Healthy Communities*,[39] describe the current recommendations and efforts for this integration.

The FHWA papers describe the environment of health and transportation by considering the key actors and the regulatory framework; relevant federal programs, initiatives, and funding sources; NGO advocacy, research, and programs; and data and tools. The results are based on an analysis of four MPOs and five states considered to be ahead in the integration of health in transportation planning.

The increasing attention being paid to health and transportation is important and offers opportunities for collaboration, new partnerships, and new funding opportunities. The FHWA paper for MPOs is summarized below.

5.1 Metropolitan Area Transportation Planning for Healthy Communities[40]

5.1.1 A Holistic Approach to Transportation and Public Health

In examining the implications of metropolitan area transportation planning for healthy communities, the focus is on planning for transportation and community design with consideration of health-related impacts. MPOs can consider health in planning through collaboration with traditional and nontraditional partners; refinement of institutional roles and responsibilities; and technical analysis.

The holistic approach to health for transportation planning involves the following:

- Active transportation:
  - Transportation systems that encourage walking or bicycling can help people to increase physical activity, resulting in health benefits and disease prevention.
  - Transportation planners can increase opportunities for nonmotorized, or active, transportation by planning for infrastructure that is safe, convenient, and attractive, and for highway and transit modes that have strong intermodal connections to active transportation.
- Safety:

  - Users of all modes of transportation should be safe. Injuries related to crashes are one of the most significant threats to human safety.
  - Planners can ensure that safety measures extend to all transportation modes, and intermodal connections, and to protecting vulnerable road users, including older and younger residents.
  - MPOs can move from traditional consideration of injury measures to a more holistic approach to health by inclusion of safety goals in combination with the other broad community health considerations.
- Air pollution, with specific implications for human health:
  - Although MPOs have well-established planning procedures to meet conformity requirements, MPOs might go further to explicitly recognize that transportation plans and decisions produce air quality outcomes that have health implications and consequently that air quality is an important component of transportation planning for healthy communities.
- Access to opportunities for healthy lifestyles:
  - Community design and transportation systems can support or inhibit residents in their pursuit of health-related activities. Access to health-related activities is especially critical for vulnerable populations, such as the elderly and children, as well as designated environmental justice communities.
  - Community design integrated with transportation can also help people to age safely in place, or to safely access all of their nutrition, exercise, and medical needs throughout each lifecycle stage.

These topics are applied in combination to allow MPOs and their partners to collaborate in transportation planning to accomplish health-related goals, introducing a new explicit emphasis on community health in metropolitan transportation planning.

5.1.2 Key Actors

Numerous federal, state, regional, and local agencies play a unique role and could be involved in the consideration of public health in the metropolitan area transportation planning process. Some of the key actors identified in the document included the following:

- FHWA and the Federal Transit Authority (FTA).
- U.S. Centers for Disease Control and Prevention.
- Federal resource, regulatory, tribal, and land management agencies.
- State departments of transportation.
- Other state agencies.
- Metropolitan planning organizations.
- Public health agencies.

- Nonprofits, advocacy, and other nongovernmental organizations.

5.1.3 Regulatory and Programmatic Framework

As noted in the report, the federal framework for metropolitan area transportation planning, as defined in the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) and the joint transportation planning requirements and continued under MAP-21, includes important elements that can support efforts by MPOs and their partners to include consideration of public health. USDOT continues to update the planning requirements to reflect MAP-21. This section references specific sections of MAP-21 that may be relevant to consideration of public health in metropolitan area transportation planning. Although there are no formal requirements that MPOs and their partners consider public health directly, there are important state regulations pertaining to adaptation of metropolitan area transportation planning to consider health. The federal and state regulations provide significant potential support and flexibility for MPOs interested in planning transportation systems, programs, and projects with benefits for public health. The metropolitan transportation plan and transportation improvement program can have elements reflecting health considerations.

5.1.4 Data and Tools

The report also discusses available technical tools that have the potential for use in considering public health in metropolitan area transportation planning. Several of these may have applicability specifically to air quality funding opportunities. Some aspects to be considered include:

- Data collection and data needs.
- Geographic information systems.
- Modeling approaches.
- Performance measures.
- Health impact assessments.
- Health economic impact assessments.

MPO staff generally do not have the public health expertise to apply data to health outcomes. Partnerships with public health agencies and nongovernmental organizations allow the data collected and model outputs derived within the MPO planning process to be analyzed for health-related applications. MPO planners do not typically require data that measures actual health outcomes, such as disease rates or other direct health metrics, for making transportation decisions. Transportation planners are most likely to use transportation surrogate measures with health implications, such as mode shift to active transportation, reduced single-occupant vehicle (SOV) miles traveled, or minutes of active transportation. Public health experts can then use these transportation measures to estimate health outcomes.

6. Congestion Mitigation and Air Quality Program

The Congestion Mitigation and Air Quality Improvement Program[41] was reauthorized in July 2012 under MAP-21. CMAQ provides funding to areas in nonattainment or maintenance for ozone, carbon monoxide, and/or particulate matter. FHWA and FTA jointly administer the program.

6.1 Funding

Up to 2012, the CMAQ Program provided nearly $30 billion in approximately 29,000 transportation-environmental projects to state DOTs, MPOs, and other sponsors across the country. MAP-21 allocated just over $2.2 billion in CMAQ funding for 2013 and 2014. The legislation places considerable emphasis on diesel engine retrofits and other efforts that focus on the priority of reducing fine particle pollution (PM 2.5).

In Texas, there are currently 19 nonattainment counties.[42] Most are designated nonattainment for not meeting the eight-hour ozone standard, except for part of Collin County (Frisco) that does not meet the lead (2008) standard, and part of El Paso County that does not meet the PM-10 standard. These counties are concentrated around Dallas (10) and Houston (eight).

The general project types that may be eligible are:[43]

- Diesel Engine Retrofits and Other Advanced Truck Technologies.
- Idle Reduction.
- Congestion Reduction and Traffic Flow Improvements.
- Freight/Intermodal.
- Transportation Control Measures.
- Transit Improvements.
- Bicycle and Pedestrian Facilities and Programs.
- Travel Demand Management.
- Public Education and Outreach Activities.
- Transportation Management Associations.
- Carpooling and Vanpooling.
- Carsharing.
- Extreme Low-Temperature Cold Start Programs.
- Training.
- Inspection/Maintenance (I/M) Programs.
- Innovative Projects.
- Alternative Fuels and Vehicles.

Total available apportionment of CMAQ funds for Texas in 2014 was $421 million.[44] This included a carryover from 2013 of $264 million. Of the available funds, $290 million was used, and the total uncommitted balance was $131 million. Large uncommitted balances have been the norm over the last few years.

The apportionment of funds to states from October 1, 2014, to July 31, 2015, for the National Highway Performance Program, Surface Transportation Program, Highway Safety Improvement Program, Railway-Highway Crossings Program, CMAQ, and Metropolitan Planning Program[45] to California and Texas is similar except for two programs. For CMAQ, Texas received nearly $137 million, or 35 percent, of the California apportionment (over $386 million), reflecting that California has 41 counties that do not meet multiple air quality standards. The Metropolitan Planning Program allocation for Texas was nearly $20 million, or 50 percent, of the California apportionment of over $40 million.

6.2 Implications of Revised Ozone NAAQS

EPA proposed to revise the NAAQS for ground-level ozone in November 2014,[46] and the final decision is expected by October 2015. The proposed standard is within the range of 65 to 70 ppb. Depending on the final NAAQS, it is anticipated that several other Texas counties will be designated nonattainment, including urban areas such as Austin and San Antonio. These areas will then be eligible for CMAQ funding as well. The practitioner workshop (described in the next section) discusses this topic in further detail.

7. Leveraging Grant and Funding Opportunities—Texas Practitioner Workshop

Public agencies in nonattainment areas in Texas have been successful in obtaining funding for their transportation air quality/emission reduction initiatives. With the revision of the ozone NAAQS later this year, the number of nonattainment counties in Texas will nearly double, and a larger number of agencies across the state will seek funding for air emission reduction projects.

The Texas A&M Transportation Institute (TTI) conducted a workshop on behalf of TxDOT with stakeholders from TxDOT and MPOs to discuss their experiences and ideas on raising funding for air quality improvements. The discussions were guided by questions on how grant opportunities are approached, whether full advantage is taken of the funding available, the lessons learned, their advice, what TxDOT can do to help, low hanging fruit, and roles and responsibilities. The Appendix to this report contains a summary of the workshop. Some of the key takeaways from the workshop included the following:

- CMAQ funds are being well utilized in Texas, though the local match is sometimes an issue. Transportation development credits (TDCs) are, however, a good source for the matching funds.
- Another aspect of CMAQ funding that agencies should consider is ensuring the sustainability of their programs beyond the funding duration.
- Scientific and standardized approaches to quantify emissions reductions achieved by proposed projects and initiatives are essential.
- Partnerships, including public-private partnerships (PPPs), are important and have been used successfully to implement several programs.
- Similarly, stakeholder engagement is key. MPOs in potential new nonattainment areas should be proactive and document all their voluntary actions toward air quality improvements.
- The Rider 7 (formerly Rider 8) grant program for near-nonattainment areas is an important source of funding.
- Funding sources that are not explicitly aimed at air quality improvements (such as Transportation Investment Generating Economic Recovery [TIGER] grants) can be levered for air quality funding by proposing projects with an air-quality-related element.

8. CONCLUSIONS AND RECOMMENDATIONS

This report summarizes programs and initiatives undertaken to reduce transportation-related mobile source emissions and describes the funding sources available to support these initiatives. Many entities are involved in the transportation air quality improvement environment, i.e., funders, those needing funding, manufacturers, developers, and associations promoting their point of view or interest.

The information in this report can be used to prioritize funding opportunities and to develop a cohesive strategy for TxDOT and its partner agencies to pursue such funding opportunities. Where needed, TxDOT (including via the interagency agreement with TTI) can assist with the following:

- Assist with matching funds.
- Provide assistance to smaller MPOs and new nonattainment areas.
- Promote standardized analytical methods through MOSERS manual updates; conduct analyses of programs and benefits.
- Identify areas for collaboration and communicate through the platform of the Technical Working Group on Mobile Source Emissions.

Some potential next steps include presenting and disseminating these findings through the TWG, preparing an overall facilitating strategy that identifies priorities and quantifies the resources needed, implementing a facilitation strategy to leverage grant and funding opportunities, and assisting with the preparation of grant applications at the request of TxDOT or its partner agencies. Follow-up on the above items can be conducted by TTI as part of the FY2016 activities, in discussion with the TxDOT project director, TWG members, and other relevant stakeholders.

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APPENDIX—SUMMARY OF PRACTITIONER WORKSHOP

This workshop was held August 3, 2015. The participants in this workshop included the following:

- Representatives from MPOs and local agencies:
  - Bob Dickinson, SETRPC.
  - Chris Evilia, Waco MPO.
  - Andrew Hoekzema, CAMPO.
  - Chris Klaus, NCTCOG.
  - Christine Ponce-Diaz, El Paso MPO.
  - Shannon Stevenson, NCTCOG.
  - Shelley Whitworth, Houston-Galveston Area Council (H-GAC).
- Representatives from TxDOT:
  - Tim Juarez.
  - Bill Knowles.
  - Travis Milner.
  - Cindy Mueller.
  - Laura Norton.
  - Mansour Shiraz.
  - Peggy Thurin.

Some of the main points highlighted by meeting participants during the open discussion are summarized below.

CMAQ grants have been used for intermodal projects, rail and port projects, transit fleets, alternative fuel vehicles, fueling facilities, and rural transit fleets and have emphasized areas such as vehicle miles traveled, idling, cold starts, and hard accelerations. Some agencies feel they have taken full advantage of available CMAQ funding, while others feel they have not. Some of the smaller areas are still learning. Local circumstances vary considerably. In the Austin area, for instance, many entities are involved in air quality: CAMPO and Capital Area Council of Governments, Travis and Williamson County (administer Low-Income Rate Assistance Program and local programs), and the privately funded Clean Air Force. The City of Austin has funded air quality projects, has a Clean Cities Program, and has a Lone Star Clean Fuels Alliance.

Matching Funds

Finding matching funds for CMAQ grants is often challenging. It is a struggle in tough economic times and even harder for smaller areas. Non-TMAs have less access to funds, and obtaining local matching funds is always a problem. It is probably the number one reason why projects get

sidelined. There is a feeling that pay should perhaps be based on emission reduction as opposed to the 80-20 split, especially on transit projects, to ensure sustainability.

SEPs can be used to match CMAQ funds because they are considered a local source. H-GAC uses SEPs with CMAQ funds for school buses. It also uses EPA loan program funds combined with TERP funds, and was able to match CMAQ grant funds to replace drayage trucks. If SEP applications are with TCEQ, funds can be used when the opportunity arises.

TDCs can be used as matching funds. TxDOT has a large pool of available TDCs; these are listed in the Unified Transportation Program (UTP) There are TDCs that can be used for new bus purchases. NCTCOG takes advantage of TDCs for toll facilities. Oil companies and other private-sector fines can also be used via a 501(c)(3) nonprofit mechanism (used by H-GAC). SEPs are not always directly for transportation but can be a source and have been used in the Beaumont–Port Arthur region for certain projects.

Resources for Developing Proposals and Grant Applications

Dedicated resources are needed to put proposals together. Think of it as financial aid. Analysis is needed to provide statistics and data to back up funding requests. As an example, H-GAC initiated a study including emissions inventory, drayage truck characteristics, and short-haul operations in the region to justify implementation funding from EPA. Global positioning system trackers were put on trucks to assist with efficiency reporting. These trackers also provided additional information on idling patterns (50 percent idling on some trucks) to substantiate more emissions reductions. In the future, it would be good to show origin and destination of trucks. Freight movement is a big driver of both congestion and air quality.

Analysis is also needed to improve understanding. The process needs to be coordinated better for more efficiency in inventory development and the modeling process, and it should allow for stakeholder outreach and participation at the front end. The MOSERS manual and any updates will be very helpful. Travel demand modeling does not account for temporary attractions and varying trip rates. Activities need to be characterized better to enable better emissions estimation. Emissions characterization in inventories need attention. There is a difference between free-flow and congested emissions. Better attribution of emissions due to congestion can influence the choice of control strategies.

University research should play a role. Research funding is available through universities and can be used in partnerships with public agencies. Larger MPOs have access to funds for research. CMAQ and local funds can also be used. EPA's Cooperative Development Agreement with TTI can be used to work on collaborative projects.

Other Avenues and Opportunities

Although nonattainment areas have been successful in obtaining CMAQ funds, due to reduced funding levels, they continue to look for other avenues and opportunities to substitute as well as supplement existing funds. Smaller cities struggle with infrastructure. Rural areas also need to be served. MPOs have learned that outside-the-box thinking is needed to be successful.

Sometimes areas obtained AQ funding by submitting projects that are broader than pure AQ projects and incorporated air quality elements into the overall project. This is the case with TIGER grant applications. Examples are clean construction equipment and street lighting (energy efficiency). Other examples can be found within Clean Cities partnerships.

MPOs have been able to fund initiatives such as monitoring, photochemical modeling, and non-road research. Certain projects such as outreach are harder to fund under the Rider 7 grants since TCEQ likes to focus more on technical aspects like inventories. Therefore, other sources such as city funds have been used for aspects such as radio ad outreach, fleet outreach, ridesharing website incentives, etc.

Some MPOs are currently working with Rider 7 funding. Grant activities include research to understand the formation of ozone and whether transport from other areas is a key factor in ozone levels.

One MPO had difficulty funding a research project through TCEQ (compliance rates of I/M program) and was able to then fund it through a county. This year, TCEQ has increased funds available and is considering a local emissions reduction grant program.

When CMAQ allowed for PPPs, H-GAC partnered with private-sector fleets. Once the private sector bought in, local government fleets were also interested. H-GAC has replaced over 3,000 trucks, trains, and transit buses. PPPs are important, but agencies should exercise caution, for example in the case of IdleAire's Truck Stop Electrification (TSE) program that shut down due to the parent company's bankruptcy.

H-GAC has a DOE grant with a private company to deploy hydrogen-fueled drayage trucks and has started to look beyond Class 8 trucks to also cover box trucks, UPS delivery trucks (100 percent plug-in hybrid electric vehicles [PHEVs]), etc.

Other sources can be targeted to get overall attainment. Agencies do not always have to focus on on-road mobile. Emissions will reduce significantly due to new standards. The next target is non-road. Other sources are now contributing a larger share to the inventory. Ground equipment electrification through DERA is an example. Information is needed on how to pursue these opportunities. CAMPO's freight study showed that 90 percent of ton-miles were construction

related and from quarries. Emissions wise, construction-related vehicles may be closer to drayage trucks than long-haul trucks.

H-GAC and the Port of Houston apply for grants depending on who is best fit for the grant and then work together on various aspects of the projects. The Department of Labor or the Texas Workforce Commission can be used for funding the commuter side. CMAQ can also help, but it may be limited based on past experience.

NCTCOG has worked on training-type activities on the workforce side (commercial vehicle driver shortage issues). H-GAC used DOE funding for curriculum in community colleges for mechanics to handle hybrids, alternative fuels, PHEVs, etc. The Clean Cities Coalition qualifies public agencies for some grant opportunities not open to others.

Under CMAQ, experimental pilots are now replaced with innovative programs, and experimental initiatives are no longer covered. One MPO faced some resistance recently on innovative projects.

Support from TxDOT

There are a number of areas where TxDOT can provide assistance to its partner agencies:

- Providing matching funds for CMAQ grants.
- Partner on Clean Cities Coalition opportunities where possible—may not be applicable for smaller areas.
- Provide support for programs along the lines of TxDOT-TCEQ's Drive Clean Across Texas (an example of an effective program).
- Provide general assistance for smaller MPOs with limited resources, and serve as a facilitator if it makes sense to do so.
- In cases where staff on air quality side is limited, provide assistance in assessing available grant opportunities (whether it is even useful to pursue) and identifying if a statewide coalition is required is helpful. Coordinate these if needed. Long-haul trucking was cited as a good area for all regions to collaborate on, as this cannot be done by one area in isolation.
- Help prioritize opportunities and define roles of various organizations.
- Assist nonattainment areas in the conformity process to also allow projects to move forward.
- Consider going after DERA grants and then distribute funds to nonattainment (NA) and near-nonattainment (NNA) areas.

Partnerships and Collaboration

Awareness and information dissemination are crucial. Relationships with local businesses are important. It is important to stay engaged with stakeholders (industry, local government) and partners to ensure participation and buy-in. Feedback can be used to identify priorities. Partnerships are important because they can help leverage funds, and there is also an opportunity to learn from each other.

Sometimes one has to work with other departments to leverage opportunities. The freight and heavy-duty diesel engine area is an example. DOE's Clean Cities Program offers partnerships and related actions, and outreach. The private sector tends to get involved. Private industry has contributed funds for an air monitoring program and helped with outreach and public relations as well as in working with TCEQ.

General Comments and Summary

Additional verbatim comments and advice from the various workshop participants included the following:

- Ask about things you are unsure and think about the long term. Document all voluntary actions to demonstrate that maximum is being done. The level of buy-in for some programs is 70 percent approval. This shows that it is possible in other areas.
- Exercise caution in working with private sector or for-profit entities. Rarely does a one size fits all approach work. Need to keep in mind local context. Needs are to be based on your local area's inventory. NNAs need to work with their peers, share information, and educate themselves.
- There are options for NNAs to take proactive actions now even before designated NA. In current attainment areas there is the advantage of more cooperation in advance of being designated NA. An example is oil companies funding programs in San Antonio in the '90s. People are willing to work together to stay out of NA.
- Transportation planning has been focused on reducing SOVs and maximizing use of existing capacity. Also focus on short trips, for example with the Baylor students; encourage walking, biking, etc.
- MAP-21 has become more restrictive. The emphasis is on performance measures. B/C analyses and such approaches will become increasingly important.
- Can leverage local government concessions for economic development projects to try to include AQ beneficial projects such as commute solution project, etc.
- Barges for empty containers to ease congestion may not help emissions unless marine engines are improved. Marine sources are sometimes low hanging fruit, for example with the DERA grants.

- It is important to define the roles and responsibilities of different players, especially in light of new nonattainment areas. Look at what value is added because administrative costs are an issue. For example, when TERP was initiated, NCTCOG was able to network locally to take advantage of TERP. This could be a discussion point for the upcoming September TWG meeting where the results of the Funding meeting can also be discussed.
- When applying for CMAQ (and other) funds, organizations need to think outside the box. Some examples are given above. Sometimes this means submitting innovative projects where AQ is only one aspect like in the TIGER program.
- A key issue that often sidelines projects is the need to find matching funds for CMAQ grants. This is even harder for smaller areas. There are a number of ways to assist in finding matching funds and TxDOT can play an important role.
- Data representing local conditions is needed to support funding requests. It is not always easy to find funding to do the necessary technical analysis. TxDOT, MPOs and universities should continue to work together. MOSERS update will be helpful. Evaluating the regional emissions inventory will allow for the identification of low hanging fruit.
- It is important to continually engage partners and stakeholders. NNAs, for instance, need to work with their peers, share information, and educate themselves. The unique roles and responsibilities of the different players need to be discussed and understood.
- CMAQ funding is important and useful to prime the pump so to speak, but areas need to have a long term funding strategy and identify sources for continuing programs. Explore PPPs but also be aware of the reality of working with for-profit organizations.