

Georgia Truck Stop Electrification (TSE)
&
Green Corridors

Georgia Environmental Protection Division
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Total Project Cost \$935,000
Federal Funds Requested \$748,000
20% Matched by Selected Vendor or Truck Stops \$187,000
May 1, 2009 thru September 30, 2010

Work Plan

Project Summary

The [Georgia Environmental Protection Division](#) (EPD) is submitting this project for funding as a part of a strategic plan to reduce nitrogen oxide (NO_x) and fine particulate emissions (PM_{2.5}) caused by idling heavy-duty long haul trucks along the interstate corridors. Hydrocarbon (HC), carbon monoxide (CO), carbon dioxide (CO₂) and toxic emissions from diesel engines will also be reduced.

Long haul trucking fleets idle their primary diesel engine to cool and heat their cabs. This use of idling a large primary diesel engine designed to haul a tractor-trailer to maintain comfort inside the cab is inefficient. Improving efficiency will reduce fuel consumption and air pollution. This project will offer truck stop electrification (TSE) technology as an alternative to idling large diesel engines. TSE technology uses electric power from a utility grid rather than operating a diesel powered internal combustion engine to provide creature comforts. While TSE technology offers economic benefits, private companies hesitate to make the capital investment consequently delaying the implementation of the technology. There is uncertainty with the ultimate direction of technology. Auxiliary power units and clean-idle engine designs are very promising technologies as well. The TSE technology is currently one of the most efficient methods for providing cab climate control and electrical power. Diesel Emission Reduction Act (DERA) funds will allow the TSE technology to further penetrate the market providing a better chance for this technology to succeed. In addition, TSE technology moves ground level emissions to power plant stacks further away, which EPD has shown reduces the ambient impact based on sensitivity studies.

Poor air quality areas such as those found in Atlanta and Macon are strongly linked to interstate corridors. Hence, it is prudent to pursue green corridors throughout the Southeast as part of a strategic plan to protect human health and the environment through attaining and maintaining health base air quality standards. As part of Georgia's comprehensive strategic idle reduction strategy, EPD is requesting through this solicitation grant funding for truck stops outside the nonattainment area. The DERA funds will compliment EPD's ongoing efforts to implement TSE technology in the nonattainment areas with the help of Congestion Mitigation Air Quality (CMAQ) funding. Grant funding is a critical part of establishing and growing green corridors by helping businesses with the upfront capital investment associated with TSE technology.

Georgia EPD will use a competitive bid process for selecting the recipient(s) of sub-grant funding. A number of truck stops throughout Georgia have expressed interest in participating in funding opportunities to electrify truck parking spaces on their property.

The ultimate locations selected will focus on creating viable green corridors in the Southeast. Georgia is conveniently connected to Florida, Alabama, North Carolina, South Carolina and Tennessee making it a critical state for green corridors to work in the

Southeast. As previously mentioned, CMAQ funding is available to be used to invest in TSE technology in Georgia's nonattainment areas. However, Georgia needs another funding source to facilitate TSE technology in areas designated as attainment. The selected locations are intended to be part of a strategic network with reasonable travel distance from current or future electrified parking sites. (See attached Georgia map showing TSE locations). Successful green corridors will need to provide truck drivers with confidence that TSE technology will be available along their routes throughout the Southeast.

The existing TSE vendors have systems that are well designed. For example, at least one vendor has the ability to adapt their system to small, medium and large lots, allowing truck stop owners to expand TSE in the future. The TSE may be equipped with stationary idle reduction services that allow truckers to shut off their engines and connect to HVAC, block heater power, refrigeration unit power and Internet and cable TV. Some vendors also offer to install electrical outlets for power Transport Refrigeration Units (TRUs). TRUs are diesel engines that are used to cool and freeze goods that are being transported by trailers. The electric outlets may also be used to provide Auxiliary Power Units (APUs) with shore power. All of these options provide idle reduction for the main engine, TRUs and APUs---three primary sources of diesel pollution and noise pollution. Beyond idle reduction and electrification, at least one vendor offers vehicle detection and anti-idling technology supports real-time sensing and reporting of truck idling. At least one vendor uses a digital security cameras and low power LED light enhance lot security and reduces ambient light pollution while complying with dark sky laws.

Recovery Act Funding Priorities

This proposed project will preserve and/or create jobs and promote economic recovery. Job creation has become a high priority for the current administration because of the recent economic downturn. The manufacturing, installation, and maintenance of TSE not only creates or preserves jobs, it also is a more efficient alternative to idling a truck's primary engine and helps reduce the need for foreign oil because it uses domestically produced electricity. This TSE project will impact a number jobs in industries related to manufacturing, installation, maintenance and repair; and electricity generation. The construction aspect alone for this project is anticipated to require a total of 363 man-days (8 hours per man day). This equates to approximately 1.5 FTE's created or retained during the life of the project. Those 363 man-days will be distributed among an estimated 48 different types of jobs. As a result this project will maximize job creation and derive a positive economic benefit for the U.S economy.

As mentioned above this project will increase and/or preserve manufacturing jobs, which is one of the job types most impacted by the current economic conditions. This project will also provide investments needed to increase economic efficiency by spurring technological advances in science and health. As previously noted, idling a truck's engine decreases fuel efficiency and is an inefficient way to keep the driver comfortable. In addition, it generates unnecessary pollutants at the ground level. TSE provides the equipment necessary to increase fuel efficiency by not idling the truck's primary engine

and uses a domestically produced fuel. As a result this project will directly invest in transportation, environmental protection and other activities that will provide long-term economic benefits to the U.S. economy. This project will be able to commence expenditures and activities as quickly as possible consistent with prudent management. EPD staff will track and measure the progress of the subgrants toward advancing the Recovery Act priorities and will report those activities as required and needed.

National Programmatic Priorities

Georgia EPD's proposed project to install TSE in counties outside of the non-attainment areas will meet the national programmatic priorities as follows:

Maximize Public Health benefits

Establishing effective green corridors throughout the Southeast will depend on the availability and reliability of TSE technology along our interstates. Truck drivers will not use the technology if it is not available along their entire route. Hence, use of TSE inside non-attainment areas will depend on the availability of this technology outside non-attainment areas. Georgia is in a good position to secure CMAQ funding to electrify parking areas inside its nonattainment areas. However, funding options are very limited for installing TSE outside nonattainment area. DERA is an ideal funding option for this project. The TSE technology reduces fuel consumption and air pollution because it is more efficient than idling the primary engine for heating and cooling the cab. Georgia is failing to meet the PM_{2.5} and ozone standards in several areas. NO_x is an important pollutant because it is a precursor to ozone formation in Georgia and the Southeast. There are also other areas currently designated as attainment that will likely transition into nonattainment in the near future unless proactive measures are taken to reduce pollution. The calculations show a 98.8% PM_{2.5} emission reduction and 98.3% NO_x emission reduction based on using electricity from power plants rather than idling a typical diesel powered engine in a legacy fleet. TSE is also expected to reduce CO, CO₂, HC and toxic air pollutants based on an estimated 71% reduction in fuel consumption using electric power vs. idling the primary diesel engine. The emission reductions will include 1.3 tons/yr for PM_{2.5}, 48 tons per year for NO_x, 11 tons per year for HC, 19 tons per year for CO and 2000 tons per year for CO₂. Furthermore, TSE shifts emissions from tailpipes to power plant stacks. Based on EPD's sensitivity studies, an equal amount of pollution from a power plant stack vs. a tailpipe will have less impact on ambient air quality, which further improves public health.

Cost Effectiveness

This technology should earn and/or save money over time. A parking space is estimated to earn \$10.41 per day for the storeowner and save the truck owner \$9.10 per day. This estimate is based on a business loan for \$11,000 per space at 12% interests that is paid back over 10 years. The diesel fuel costs \$3.88 per gallon and electricity costs \$0.10 per KW-hr. The calculation assumes a truck uses power for 10-hours a day and the

storeowner charges \$2.00 per hour. A TSE system consumes 2,200 watts instead of burning 0.75 gallons of diesel fuel per hour.

If proven, this technology should generate money rather than cost money. However, the capital investment and uncertainty of the prevailing technology inhibits private investment necessitating the need for grant funding. There is a cost associated to “kick start” the technology, which is why grant funding is needed. The estimated cost benefit based on DERA funding is \$56,000 per ton for PM_{2.5} reduction; \$1,500 per ton for NO_x reduction; \$7,000 per ton for HC reduction; \$4,000 per ton for CO reduction; and \$37 per ton for CO₂ reduction. The DERA funding cost estimates do not account for fuel savings or long term benefits created by TSE demand as this technology becomes proven and accepted to truck drivers.

Project Area

This project will take place at truck stops in Georgia located in counties outside areas designated as non-attainment for PM_{2.5} and Ozone. Employees and customers of truck stops are exposed to high concentrations of diesel exhaust as a result of large numbers of operating diesel engines in a very small area. Communities located nearby are also affected by higher concentrations of PM_{2.5} due to their proximity to the truck stops. This project is a very important part of convincing drivers to choose this technology, which is being promoted by the use of CMAQ funding in non-attainment areas. More specifically, it is important to establish green corridors that provide drivers reliable TSE technology through their entire route.

Technology life and Fuel efficiency

The TSE systems are expected to last ten or more years. The technology uses electricity as an alternative energy source to diesel fuel during idle modes. Hence, diesel fuel consumption is reduced. TSE systems are also more efficient than operating the primary engine or even most diesel powered APUs. As a result, TSE reduces overall energy use.

Leveraging Resources

The TSE vendor or the station owner will match 20%. This will be accomplished by having the vendor or the station owner pay for electrifying two spaces for every eight spaces paid for through the DERA grant.

Regional Significance

This proposed project will meet the U.S. EPA Region IV priority for the “development of a Regional Green Corridors Program focusing on idle reductions ... for interstate trucking along interstate corridors including any aspect of freight movement.” This

project targets truckstops that are adjacent to interstates in Georgia and that are geographically distributed.

Past Performances

EPD's Programmatic Capability

Within the last three years EPD has managed the Georgia Pacific Supplemental Environmental Project (GPSEP), Congestion Mitigation Air Quality funds (CMAQ), and a U. S. Department of Energy (DOE) grant. Our organization was able to meet the challenge of managing these grants successfully. Details about each of these grants are included in the next section. EPD has retained their experienced staff. Staff has gained a tremendous amount of experience in retrofit technologies from their time spent on projects, attending conferences, and performing research.

EPD's Environmental Results of Past Performances

The Georgia EPD is responsible for environmental laws and rules in the state of Georgia. EPD has over 900 employees working in Land Protection, Water Protection, Hazardous Waste, and Air Protection. Within the last three years, EPD has entered into a myriad of EPA funded assistance agreements that included a wide variety of activities such as monitoring streams, taking air quality samples, permitting, overseeing the clean up of hazardous waste sites, and retrofitting school buses. The most pertinent assistance agreements performed by EPD are listed below.

The Georgia Pacific Supplemental Environmental Project (GPSEP) consisted of 3.6 million dollars to retrofit school buses in Georgia. These funds were used to retrofit all eligible buses in the City of Atlanta's school bus fleet. The funds that were left over from this project are being used to retrofit 2005 and 2006 school buses throughout Georgia.

The Georgia CMAQ funds consist of approximately 17 million dollars that EPD will use to retrofit school buses and other heavy-duty vehicles in Georgia's nonattainment areas. EPD, with the help of Mothers and Others for Clean Air and Southern Alliance for Clean Energy (SACE) was successful in acquiring \$250,000 in matching funds from the Georgia General Assembly. The Georgia Regional Transportation Authority (GRTA) contributed \$40,000 in matching funds for a total match amount of \$290,000. It is anticipated that approximately 2,161 vehicles will be retrofitted with this money.

The last project mentioned is a grant through the U.S. Department of Energy to install diesel auxiliary power units (APU) on long haul trucks with sleeper berths. The diesel APUs provided electricity and air conditioning for driver comfort. The ultimate purpose of the project was to evaluate fuel and cost savings achieved by using a diesel APU rather than idling the main engine. The DOE grant passed through the Georgia Environmental Facilities Authority (GEFA) to Clean Cities-Atlanta (CC-A). EPD is an integral partner in the CC-A organization, and was charged with overseeing this grant. Li-Way Transfer and Storage, Incorporated (Li-Way) was the trucking company that has to install and

evaluate the APUs. The total project cost was \$106,476 with Li-Way matching at least 50%. The Center for Transportation and the Environment (CTE) compiled the data and prepared reports. The project successfully deployed fourteen APUs and was completed on time.

Vendor's Programmatic Capability & Environmental Results of Past Performances

EPD has reviewed the capabilities of various vendors who would be capable of assisting in completing this project if selected. EPD has preliminarily identified vendor(s) who are capable of performing the work in this project and provide the match. EPD will have a short solicitation period to allow all qualified vendors to apply. The selected vendor's system capabilities will comply with EPA's published description of stationary idle reduction technologies.

Environmental Results

Specific Environmental Outputs

Measurable outputs will include the number of spaces electrified using grant money, the number of spaces electrified with match, the cost to electrify each parking spot, data showing usage for the first year, quarterly reports and a final report. This project proposes to electrify 85 parking spaces. The DERA grant will pay no more than \$11,000 per spot. This grant will pay for eight out of ten electrified spots with the selected vendor or the truck stop paying for the other two electrified parking spots. The target average utilization is 10 hours/day for each space.

As required, EPD will go through a bid process. The solicitation process will take approximately two months and the selection process will take approximately one month. The TSE vendor will likely serve as a General Contractor for the project; consequently, they would select sub-contractors for excavation, cabling, electrical utilities, and Cable TV and Internet providers. Construction of each truck stop will take about 6 months. The construction projects will overlap to assure all TSE installations are completed by September 30, 2010. The following provides a 6-month construction schedule timeline that would apply to each truck stop undergoing TSE installation:

Vendor TSE Construction Schedule																										
TASK	WEEKS																									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1. Surveying	█	█	█																							
2. Site Design	█	█	█	█	█																					
3. Contractor Selection					█	█	█	█	█																	
4. Permits						█	█	█	█	█	█	█	█	█												
5. Power Transformer			█	█	█	█	█	█	█	█	█	█	█	█	█											
6. Construction										█	█	█	█	█	█	█	█	█	█							
7. Electrical Installation														█	█	█	█									
8. Barrier Installation														█	█	█	█	█	█	█						
9. Equipment Installation																					█	█	█	█	█	█

Desired Environmental Outcomes

The short-term outcomes for this project will be improved ambient air quality by immediately reducing PM_{2.5} and NO_x emissions. If successful, this technology will save rather than cost money by reducing diesel fuel usage. The estimated cost savings is expected to be \$19.50 per day for each parking spot. At the time the original emission benefits were calculated, EPA’s diesel emission quantifier did not provide a method for assessing emission reductions from TSE. Hence, the estimates in this application relied on data from the U.S. EPA’s 2002 [Study of Exhaust Emissions from Idling Heavy-Duty Diesel Trucks and Commercially Available Idle-Reducing Devices](#). The study estimated an average truck to have 144 grams per hour (.317 lb/hr) of NO_x emissions. The U.S. EPA provided PM_{2.5} emissions data in a paper entitled [Particulate Matter and Aldehyde Emissions From Idling Heavy-Duty Diesel Trucks](#). The data provided an average PM_{2.5} emission rate of 3.92 grams per hour (0.00864 lb/hr). The following table shows the projected emission reductions and cost effectiveness of the DERA funding without including the cost benefit of the fuel savings.

Pollutants	Total Emission Reductions (tons/day)	Total Emission Reductions (tons/year)	Total emission reductions over 10 years – tons per project life	Cost-effectiveness in dollars per ton based on 10 year project life (\$/ton) -With no savings
PM _{2.5}	0.0036	1.3	13	56,000
NO _x	0.13	48	480	1,500
HC	0.029	11	110	7,000
CO	.052	19	190	4,000
CO ₂	5.5	2000	20000	37

The desired medium term outcome of this project will include TSE becoming a mainstay approach for reducing PM_{2.5} and ozone at ground level by establishing green corridors throughout the southeast. The green corridor concept should be part of a paradigm shift. The technology will save money if drivers choose to use it. The paradigm shift will be

complete when green field truck stops are inherently built with TSE technology rather than installing the systems as an afterthought.

The desired long-term outcome is that this technology coupled with other emission reduction strategies brings all areas into attainment with NAAQS throughout the Southeast for safer air and healthier lives.

Budget Narrative

EPD is requesting \$748,000 in Federal funds. The funds will be used to purchase and install TSE. The cost of electrifying a spot is estimated at \$11,000. The grant will pay for electrifying 68 parking spots while the vendor or the truck stop owners will pay for 17 parking spots. The 17 parking paid for by the vendor or the truck stop will cost \$187,000 bringing the total project expenditures to \$935,000.

Applicant Fleet Description

Fleets can include any combination of on-road long haul trucks. A spreadsheet is attached that provides an example fleet.

Attachments/Appendix

- Emission Calculation Spreadsheet (See Excel Spread Sheet)
- Georgia Map Showing Existing and Proposed TSE Locations