NESCAUM GHG Case Study
The Hunts Point Truck/ Trailer Electrification Pilot Project

Section 1 – Executive Summary

Drivers of long-haul trucks currently keep their truck and refrigerated trailer engines running while they rest or wait to unload at the Hunts Point Cooperative Market. For this project the New York Power Authority will oversee the installation of truck/trailer electrification devices at 32 truck parking spaces. These electrification devices will allow drivers to power cab/sleeper compartment climate control systems and appliances, as well as refrigerated trailer units, without running their engines.

The Hunts Point Truck/Trailer Electrification Project involves fuel switching from idling heavy duty diesel trucks to electricity from the regional power pool. Hundreds of the long haul trucks with refrigerated trailers enter the Hunts Point Cooperative Market every day. Truck drivers typically idle their diesel engines when they arrive at the Market to provide air-conditioning or heat to the sleeper cab, to keep the engine and fuel warm in cold weather, to operate appliances, and to maintain vehicle battery charge while appliances are in use. This fuel switch from diesel to electric results in the reduction of greenhouse gas emissions and local air pollution and increased demand from the regional New York Power Pool.

Operating heavy diesel engines at idle to provide heating, ventilation and air conditioning (HVAC) in the sleeper compartment is very inefficient. Even under the most extreme winter conditions (when heat from the engine not only warms the sleeper, but keeps the engine from freezing), over 85 percent of the energy in the diesel fuel is wasted as heat and atmospheric pollutants. Under summer conditions, used solely for air conditioning, the efficiency falls even more, with 94 percent of energy from the diesel fuel wasted.

Fossil fuels can be transformed into useable energy more cleanly and efficiently by commercial power plants than by the idling diesel engines of over-the-road trucks. Using the power grid to provide HVAC service to a truck's cab during layover releases to the atmosphere about 70% less CO_2, 95% less NOx, 98% less PM, 99%, and 99% less VOC and CO emissions as would the truck's diesel engine. Total estimated emission reductions resulting from the full implementation of this project (32 truck spaces retrofitted with the technology) equal 989 metric tons of CO_2 annually. Additional air pollutant emissions are reduced with the full implementation of this project. Estimated annual emission reductions include: 16.3 metric tons of NOx, 0.30 tons of PM, 5.09 tons of VOCs, and 16.47 tons of CO. Engine idling noise and high-localized levels of CO contribute to driver fatigue. Truck and trailer electrification removes truck and adjacent truck noise and vibration and eliminates CO emissions, enabling drivers to rest more comfortably.

Section 2 - Strategy Summary

The long haul trucks that enter the Hunts Point Cooperative Market every day are equipped with large, built-in sleeper compartments. Truck drivers typically idle their

engines to stay comfortable while they rest for the mandated US Department of Transportation regulated eight hours or wait to unload. They idle their engines to keep the engine and fuel warm in cold weather, to provide air-conditioning or heat to their sleeper cabs, and to operate appliances. Sleeping compartments are generally furnished with such appliances as microwave ovens, refrigerators, televisions and laptop computers. Drivers also run the diesel engines on the refrigerated trailers while at the Market to power the trailer refrigeration units. Many reefers that come to the Market have duel-fuel (diesel/electric) capability and could be plugged into ground electric outlets.

This project will demonstrate the feasibility and benefits of a complete truck/trailer electrification package. IdleAire Technologies Corporation of Knoxville, Tennessee has developed an electrification system that brings HVAC to the cab and sleeper compartment via an external device. The company installs a highly efficient, external heating, ventilation and air conditioning unit at each individual truck parking space beside or above each truck. HVAC are delivered to the truck by a quiet, microprocessor-controlled system that connects the truck-side control console and air supply/return to the external HVAC device. The control console mounts in a window on either side of the truck, and contains temperature controls, credit card reader, display and keypad. It also provides 110 VAC electric power for appliances inside the cab as well as television, local telephone and Internet service. An additional 110 VAC outlet mounted on the outside of the control console provides external power hookup for engine block heating. The IdleAire electrification system also includes a separate, ground-mounted 220 VAC outlet to provide power for duel-fuel reefer units (see Figure 1).

The communications systems embedded within the IdleAire control console provide a built-in system for communicating with drivers waiting to unload at the Market (see Figure 2). IdleAire technology will thus be able to reduce idling emissions at the loading bays and increase the facility efficiency by conveying dispatcher instructions to drivers. The IdleAire system represents new technology and a new industry. The technology incorporates standard, proven components that have been reassembled into a package with high tech monitoring and communications capability. The company has tested the design by running multiple HVAC devices under monitored test conditions for thousands of hours. Tests show that the high capacity HVAC device will successfully heat and cool a truck cab and sleeper. The standard truck A/C unit is 7,500 BTU; the IdleAire unit produces 12,000 BTU of cooling. IdleAire is in the process of deploying field units for further testing by engineers and truck drivers in Knoxville, Tennessee.

Section 3 - Source Identification/Location and Contact Name

Hunts Point is a peninsula in the south-easternmost corner of the South Bronx in New York City. Though its land area covers approximately one square mile, it houses many industrial facilities, including more than twenty waste transfer stations and a sewage treatment plant. Many food-related industries are also located in Hunts Point, including the Hunts Point Market. The Hunts Point Market is the world's largest food distribution center and consists of the Hunts Point Cooperative Market, a meat market, and The Hunts Point Produce Market. Eighty percent of the region's produce and forty percent of its meat is shipped through the Hunts Point Market. The Hunts Point Cooperative Market is home to 47 independent wholesale food businesses primarily involved in the production, processing, distribution, and sale of meat and meat products throughout the tri-state area. This market is one of the major facilities in the world's largest wholesale food distribution center and is located on 60 acres of property in Bronx, New York. All of these industries together account for more than 20,000 diesel truck trips into and out of the peninsula each week.

Hunts Point Cooperative Market
C101 - 355 Food Center Drive
Bronx, NY 10474
Tel: (718) 842-7466
Fax: (718) 589-5018

Contact:

T. J. Roskelley
NESCAUM – Clean Air Communities
129 Portland Street
Boston, MA 02114
Tel: 617-367-8540
Fax: 617-742-9162
E Mail: tjroskelley@nescaum.org

Section 4 - Baseline Emissions Determination/Base Period Used

Published data exists on emissions produced by idling trucks. By knowing the number of parking spaces at any given facility and the average daily usage for each space, an emissions baseline can be generated. On average an idling long haul truck produces the following emissions each hour:

NOx=122 grams per hour (g/h),
PM=2.19 g/h,
VOC=36.4 g/h,
CO=118 g/h,
CO_2=10,070 g/h

Emission factors for heavy-duty diesel trucks have been published by three sources: U.S. EPA (Mobile5 model), Colorado Institute for Fuels and Environmental Research, and University of California Davis. The values used here are averages derived from these three studies. Emission factors for reefers are not included. If the average truck parking space at the Market is used 12 hours per day, the baseline for this parking space is 12 times these hourly numbers as indicated below:

NOx=1,464 grams,
PM= 26.3 grams,
VOC=436.8 grams,
CO= 1,416 grams,
CO_2=120,840 grams

The baseline for this project is the estimated emissions associated diesel truck idling emissions as illustrated in Table 1.

Table 1: Baseline Truck Idling Emission Rate Data

Type	CO_2	NO_X	PM	VOC	CO
Idling emissions (grams/truck/hr)[1]	10,070	122	2.19	36.4	118

Section 5 - Demonstration of Surplus

IdleAire Technologies Corporation of Knoxville, Tennessee has developed an electrification system that brings heating, ventilation and air conditioning (HVAC) to the cab and sleeper compartment via an external device. The company installs a highly efficient, external heating, ventilation and air conditioning unit at each individual truck parking space beside or above each truck. With the IdleAire technology, all idling emissions are eliminated while the system is in use. This technology reduces idling by

[1] Emission factors for heavy-duty diesel trucks have been published by three sources: U.S. EPA (Mobile5 model), Colorado Institute for Fuels and Environmental Research, and University of California Davis. The values used here are averages derived from these three studies. Emission factors for reefers are not included.

diesel trucks – a major priority for EPA in urban areas. New York City has an idling law which states that "no person shall cause or permit the engine of a motor vehicle to idle for longer than three minutes while parking…standing…or stopping unless the engine is used to operate a loading, unloading or processing device." [2] However, this regulation is not enforced at the Hunts Point Market. Many trucks sit idling at the market to keep their goods refrigerated while they wait to unload their products.

Section 6 - Demonstration of Real

With the IdleAire technology, all idling emissions are eliminated while the system is in use. As a result, local air pollution impacts are traded off or displaced with emissions from the regional power pool. Operating heavy diesel engines at idle to provide HVAC in the sleeper compartment is very inefficient. Even under the most extreme winter conditions (when heat from the engine not only warms the sleeper, but keeps the engine from freezing), over 85 percent of the energy in the diesel fuel is wasted as heat and atmospheric pollutants. Under summer conditions, used solely for air conditioning, the efficiency falls even more, with 94 percent of energy from the diesel fuel wasted. Fossil fuels can be transformed into useable energy more cleanly and efficiently by commercial power plants than by the idling diesel engines of over-the-road trucks

Section 7 - Quantification of Emission Reductions

Among the advantages of IdleAire's technology is the ability to monitor precisely the usage of the system and thereby to report accurately emission reductions associated with this usage. With the IdleAire technology, all idling emissions are eliminated while the system is in use. The microprocessor controlled control module inserted into each cab monitors how long each truck is connected and how long the external HVAC system is in use. Therefore, precise measurements of emission reductions at each parking space are possible simply by multiplying the known hourly emission rates by the number of hours. By knowing the number of spaces in use at any given time, aggregate emissions reduction calculations are easy to perform. The emissions reductions that would be obtained by outfitting 32 truck parking spaces at the Market with truck electrification stations are illustrated in Table 2.

Table 2: Electrification Emissions Reductions at Hunts Point (Metric Tons/Year)

Type	NO_X	PM	VOC	CO	CO_2
Emissions produced at truck parking spaces	17.1	0.31	5.10	16.54	1,411
Emissions to generate equivalent electrical power*	0.85	0.005	0.008	0.07	422
Emissions removed	16.3	0.30	5.09	16.47	989

*Emission factors for equivalent production of electric power are based on work by the Argonne National Laboratory (Stodolsky, Frank, Linda Gaines, and Anant Vyas. *Analysis of Technology Options to Reduce the Fuel Consumption of Idling Trucks*. Argonne National Laboratory

[2] Chapter 1-Air Pollution Control §24-163.

ANL/ESD-43 June 2000). Argonne assumed 4.3kW per operating hour. Emissions per kWh based on current U.S. mix of oil, natural gas, coal, nuclear, and other sources, as specified by Argonne's GREET model.

Section 8 - Data Integrity and Uncertainty

The electrification technology removes significant amounts of idling truck emissions, which are easily monitored and verified. This case study is an estimate of the emission reduction benefits of the full implementation of the project (32 truck spaces). The baseline heavy-duty truck idling emissions factors are a main area of uncertainty as are the emissions to generate an equivalent amount of electrical power. The emissions factors for the idling trucks are average factors from three different data sources. In the future monitoring of the project, trucks that participate will be emissions tested on site, providing for a more accurate accounting of actual baseline idling emissions. In addition, the actual electric usage and emission factors used to determine the associated emissions from the New York Power Pool will be accurately tracked and the marginal emission rate of the grid will be used in the ongoing monitoring, tracking and reporting of the project results.

Section 9 - Emission Reduction Credits Created

Total estimated emission reductions resulting from the full implementation of this project are 989 metric tons of CO_2 annually. To determine the emissions reduced at the truck parking spaces the emission factors in grams per hour were converted into pounds by dividing by 454. Because the average time the spaces would be filled with an idling truck was 12 hours per day, we assumed that the space would be filled for 4,380 hours per year (one half of total hours in one year – 8,760). In order to determine the impact of 32 spaces annually we then multiplied the product of the earlier calculation by 32. Finally we divided that value by 2,200 to come to the result in metric tons/year.

Section 10 - Ownership

The New York Power Authority and the New York City Department of Transportation will provide $100,000 to cover the cost of electrical infrastructure. The New York Power Authority will contribute a total of $75,000. The New York City Department of Transportation will provide an additional $25,000 in Congestion Mitigation and Air Quality Program (CMAQ) funds. $6,250 of the Power Authority's total contribution of $75,000 will serve as the required local 20% CMAQ match. As stated above, the Power Authority will contribute an additional $81,545 in in-kind costs for project management. IdleAire Technologies Corporation will contribute $111,674 in in-kind costs for the three-month free trial period. Clean Air Communities is providing over $430,000 in project financing. Clean Air Communities retains the rights to all of the emission reductions associated with the lifetime of this project as set forth in the project funding agreements.

Section 11 - Other Environmental Impacts

Additional air pollutant emissions are reduced with the full implementation of this project. Estimated annual emission reductions include: 16.3 metric tons of NOx, 0.30 tons of PM, 5.09 tons of VOCs, and 16.47 tons of CO. Engine idling noise and high-localized levels of CO contribute to driver fatigue. Truck and trailer electrification

removes same truck and adjacent truck noise and vibration and eliminates CO emissions, enabling drivers to rest more comfortably. Numerous studies have linked driver fatigue with traffic accidents. One of the most recent statistics indicates that fatigue contributes to 40 percent of heavy truck accidents, and 50 percent of all U.S. freeway fatalities.

Section 12 - Registration Statement and Signature

As a representative of NESCAUM presenting this case study I have personally examined the case study and believe it to be true and accurately represents the activities of Clean Air Communities.

_____

T. J. Roskelley