



Connecticut Department of Transportation

BRANFORD STEAM RAILROAD

TIGER Discretionary Grant Application

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Project Information (K)

- i. Type of Project
Freight Rail

- ii. Project Location
North Branford and Branford, Connecticut, within the 3rd Congressional Districts

- iii. Project Area
Urban and Rural

- iv. Amount of Grant Funds Sought
\$6,455,000

- v. DUNS Number
807854583

- vi. Central Contractor Registration Confirmation Number
QZX9NA

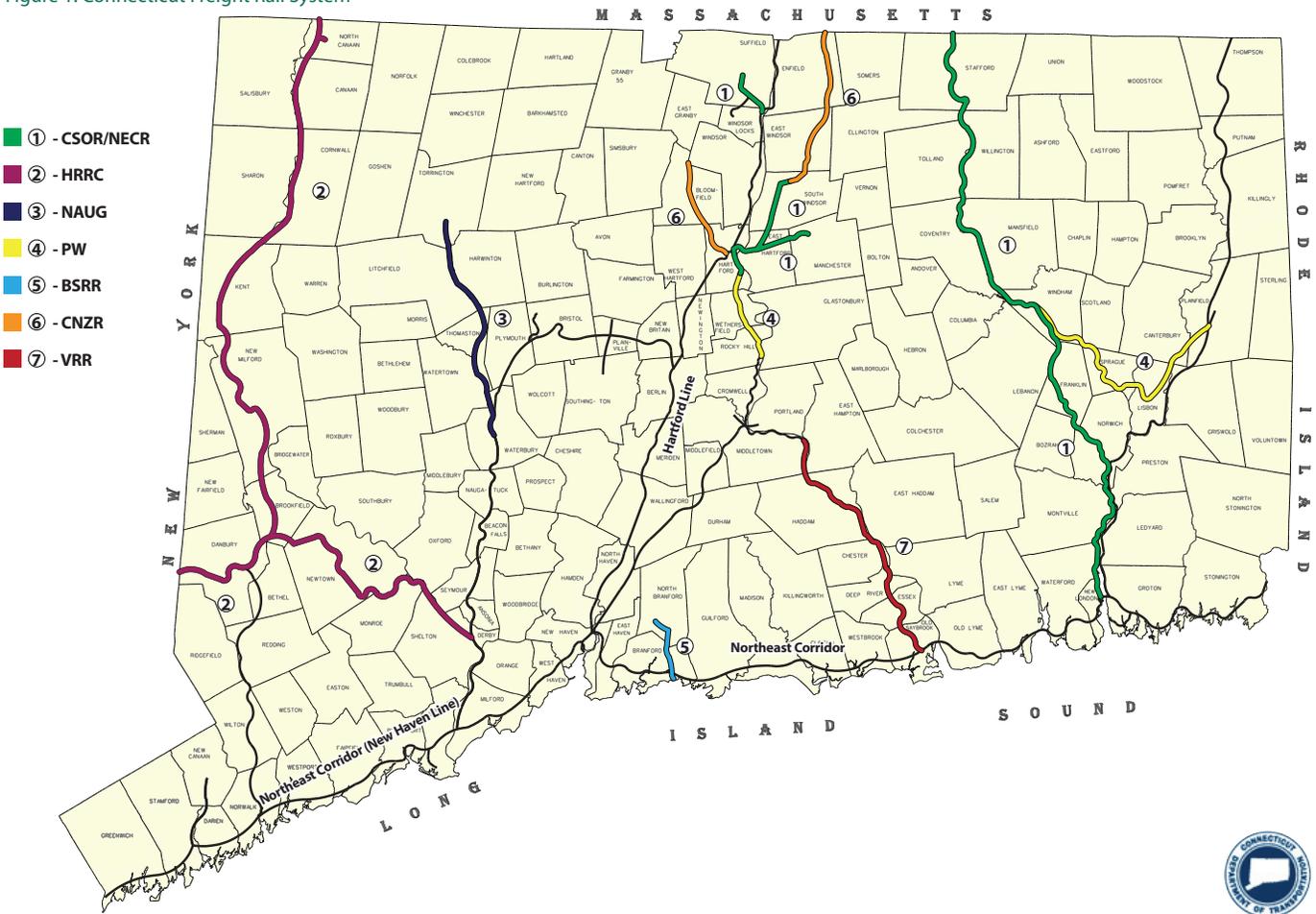
Ladies and Gentlemen of the Selection Committee:

Thank you for the opportunity to request ARRA TIGER Discretionary Grant funding (TIGER funding) for Connecticut’s continuing efforts to improve our statewide freight rail network. Over the past ten years, the Connecticut Department of Transportation (ConnDOT) has directly invested over \$282.5 million into the freight rail network. This investment has allowed ConnDOT to incrementally improve the rail infrastructure. In addition, the State has invested over \$1.56 billion in the New Haven Main Line (NHML), a key segment of the Northeast Corridor. The NHML investments, targeted for passenger rail service, also secondarily benefit freight rail by permitting increased freight train speeds. Numerous upgrades and improvements are still necessary however, to make the overall system economically viable for the future. In some cases, urgent repairs and upgrades are needed in order to provide a more cost effective, safe, and sustainable means of efficiently transporting goods.

The receipt of the requested funding from the TIGER Discretionary Program, which is significantly less than the investment already made by the state, will provide the much needed incremental funding to completely address priority improvements in the system. To ensure that the greatest needs are addressed, ConnDOT has partnered with seven of the freight rail operators in the state to determine which projects have the highest priority and ability to leverage past investment in the network. The projects associated with each of these freight rail operators will be submitted as a separate application, for a total of seven applications. These projects, which are in keeping with the intent of the TIGER Grant program and will benefit operations on over three-quarters of the state freight rail system (Figure 1), are:

- › Central New England Railroad (CNZR): Rail improvements to Armory Line and Griffin Line to increase operating speeds.
- › Housatonic Railroad (HRRC): Replacement of track and crossings, bridge modifications, upgrades to crossings, and access to businesses along several key segments of their 83-mile system.
- › Naugatuck Railroad Company (NAUG): Upgrades to the 19.5-mile Torrington Line, including culverts, ties and ballast, and grade crossing improvements.

Figure 1. Connecticut Freight Rail System



- › Providence & Worcester Railroad (PW): Rail improvements to Willimantic and Middletown Branches to increase operating speeds.
- › RailAmerica’s Connecticut Southern Railroad Company (CSO) and New England Central Railroad (NECR): Bridge work, replacement of ties and ballast, surfacing, and switch rebuilding over 76 miles of track.
- › Tilcon/Branford Steam Railroad (BSRR): Replacement and repowering of locomotives and replacement of hopper railcars.
- › Valley Railroad Company (VRR): Resurrection of a key dormant section of the line and track rehabilitation along the remaining segments.

These upgrades and improvements will:

- › Reduce the number of truck trips and amount of carbon emissions associated with cargo shipment
- › Create new jobs throughout the state
- › Not require any additional environmental permits
- › Not be contingent upon the completion of any other projects
- › Be immediately ready to begin work with all funds being utilized prior to February 2012.

This application specifically addresses the Branford Steam Railroad (BSRR) project, which includes replacement of BSRR’s single main line locomotive with new Brookville 115-ton CoGeneration Locomotives; repowering existing SW1001 switcher locomotives with 2-Engine CoGeneration Conversion; and replacement of 40 (100-ton) hopper railcars. The sections of the statewide freight rail network included in this application are shown in Figure 2.

Application Overview

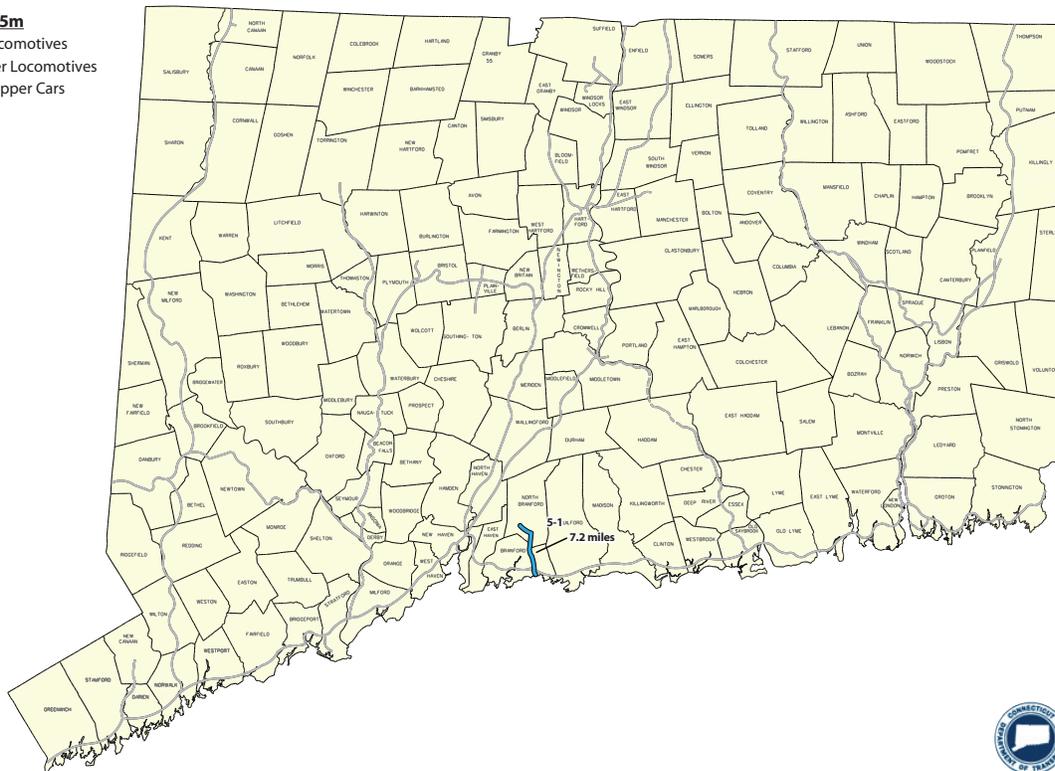
The application document responds specifically and in detail to the interim notice published in the Federal Register on May 18, 2009 and the operative notice published June 17, 2009. This application consists of two parts.

1. The first describes the needs of the state freight rail system and the broad-based resultant benefits from TIGER funding for the entire State of Connecticut.
2. The second addresses the Branford Steam Railroad (BSRR) project and its specific application for the TIGER Grant funding. This project will cost \$6,455,000 and is a critical piece of the repair needed for the statewide freight rail network.

Figure 2. Branford Steam Railroad

5-1 \$6.45m

- New Locomotives
- Repower Locomotives
- New Hopper Cars



Background of Project and Existing Condition of Freight Rail Network:

The Connecticut freight rail network is a critical component of the northeast regional rail system. Freight rail service is an important component of the American industries supply chain and a vital component to Connecticut’s economy. Connecticut moves 3.6 million tons of freight over 10 freight railroads annually. This network connects with the Ports of New York and New Jersey, which are critical to the continued economic growth and success of the Northeast region.

The Connecticut freight rail system needs infrastructure upgrades and repairs immediately in order to meet the need to move freight more efficiently and ensure its continued role in the movement of goods throughout the state and the northeast region. Portions of the rail lines are so severely worn that they are at the end of their serviceable life. Older, under-maintained tracks result in reduced operating speeds, which slow the movement of cargo and ultimately increase costs for the consumer. Bridges and track structure require strengthening and clearances increased to meet the demands of today’s higher capacity rail equipment. Inadequate grade crossing protection systems create conditions that are less desirable for pedestrians, vehicles, and trains and result in unnecessary delays to both vehicular and train traffic.



This image shows the relationship between the freight rail network and the regional electric grids. NAUG is hauling over-dimension and over-weight electric transformers to Northeast Utility’s Watertown Substation, which feeds Fairfield County. Repairs and improvements to the network are imperative to ensure the ability to move over-size loads.

Project Benefits

The combined benefits of these seven initiatives include reducing truck trips and carbon emissions, creating jobs, providing economic growth opportunities, and improving safety measures within the statewide freight rail system. Each rail car carries the equivalent of four trucks. Enabling the increased use of freight rail will reduce the number of truck trips necessary along the roads of New England, thereby reducing traffic congestion, reducing crashes and saving lives, and reducing carbon emissions.

Thank you for your time and consideration of our submission.

Sincerely,

James P. Redeker
Bureau Chief – Public Transportation

C. Project Description

Overview

Connecticut plans to increase rail freight shipments by 25 percent over the next two decades to support economic growth and reduce the volume of truck traffic. The state currently moves 3.6 million tons of freight over 10 freight railroads annually. To realize a 25 percent increase, upgrades and improvements are urgently needed to repair or replace aging infrastructure and equipment.

Connecticut is strategically located between the major northeastern urban centers of New York City and Boston, offering the state unlimited opportunities for shipping cargo. Its rail system also assures workable freight rail access to the Ports of New York and New Jersey, as well as the corridor related to the North American Free Trade Agreement. Over the past ten years, the state has invested over \$282.5 million in the network to improve the move-

ment of freight rail. Among the many projects is the reconstruction and relocation of the main rail spur on the east side of the Port of New Haven to achieve a direct rail connection to this strategic port. Direct port to rail connections in the state will serve the rapidly growing container segment of rail traffic to help remove long-haul trucks from highways and deliver products to consumers faster, as well as offer an alternate to the larger ports (New York and New Jersey).

Implementing the proposed upgrades and infrastructure improvements to the state’s freight rail network will allow the continued growth of the freight industry and will result in a reduction in the number of truck trips made on the regional highways. Trucks have a significant effect on highway traffic conditions, particularly along the highly congested I-84, I-91, and I-95 corridors in Connecticut. Much of the congestion occurs at the bottlenecks in the



This image shows a track worker conducting much needed maintenance. An NAUG track worker is jacking and leveling the track in preparation for the tamping machine to vibrate and compact the stone ballast around and beneath the wooden cross-ties.

Hartford and New Haven areas. The congestion results in increased fuel usage, increase green houses gas emissions, increased travel time, and thus increased cost to the consumer.

The freight rail network improvements will also result in fewer carbon dioxide emissions being released. The movement of cargo by rail produces much lower emissions than the movement of the same amount of cargo by truck. On average, it takes four trucks to move the same amount of cargo that one rail car can move.

There are a number of jobs that would be created as a result of these infrastructure improvements. In addition to new positions within each freight rail company, there would be a number of construction positions, for both the rail construction and any subsequent induced developments, as a result of the improvements. Using the standard formula for stimulus job creation, where a \$50,000 investment creates one full-time job (2080 work-hour per year basis), 2,180 jobs will be created by the proposed improvements and repairs for the statewide freight rail network. Follow-on jobs will also occur in other regions and businesses, fueled by the growth of transport throughout the state. These follow-on jobs will include positions in the manufacturing and supply industry. Private companies are increasingly seeking to transport cargo via rail due to its cost savings and environmental benefits. The improvements and upgrades to the statewide freight rail system are required to stay competitive with the market.

Detailed Description of Statewide Rail Infrastructure Improvements

ConnDOT has partnered with seven freight rail operators to determine the most critical repairs that need to be made to improve the network. These freight rail companies and their projects include:

- › Central New England Railroad is a short-line railroad that operates in Connecticut over the Department's Griffin Line between Hartford and Windsor (8.7 miles) and over the Department's Armory Branch Line between South Windsor and the Massachusetts State Line in Enfield (13.5 miles). CNZR priority projects include rail improvements to the Armory Line and the Griffin Line to increase operating speeds.
- › Housatonic Railroad Company (HRRC) is a regional short line that operates in the western part of Connecticut and in Massachusetts and New York along the Berkshire Line (50.0 miles) and the Maybrook Line (33.5 miles). These two lines form a portion of a critical rail route in western Connecticut. Priority improvements for HRRC include replacement of track and crossings, bridge modifications, upgrades to at-grade crossings, and improved rail access to businesses.
- › Naugatuck Railroad Company (NAUG) is a shortline railroad that operates over the Department's Torrington Branch Line between Waterbury and Torrington (19.5 miles). Torrington Line improvements include repairing or replacing culverts, ties and ballast, and grade crossing improvements.
- › Providence and Worcester Railroad Company (PW) is a regional Class II railroad that operates in southern New England, and as far south as New York City. In Connecticut, PW operates over 238.5 miles of track. Priority projects for PW include track improvements to the Willimantic Branch and the Middletown Secondary to increase operating speeds and improve system interconnectivity.
- › Rail America, Incorporated has two subsidiaries that operate in Connecticut: the New England Central Railroad (NECR), and the Connecticut Southern Railroad (CSOR). NECR operates on their own line between New London and Stafford (55.8 miles) and on to East Alberg, Vermont where they connect with the Canadian National Railroad. CSOR operates on CSX from West Springfield to Springfield, Massachusetts, and on Amtrak from Springfield to North Haven (53 Miles). CSOR owns and operates the Manchester Secondary Line (9.6 miles), the Armory Branch Line (6.8 miles), and the Suffolk Branch Line (4.4 miles). They also operate on the spur track to Bradley Airport that is owned by the state (2.4 miles). Work for NECR and CSO includes bridge improvements, replacement of ties and ballast, surfacing, and switch rebuilding to improve operating speeds and rail areas to existing and potentially new customers.
- › (Tilcon) Branford Steam Railroad (BSRR) is a subsidiary of Tilcon Connecticut, Incorporated, and provides service between their trap rock quarry in North Branford and their barge loading facility on Long Island Sound in Branford (7.2 miles). Priority projects for BSRR include replacement and upgrade of locomotives and replacement of hopper railcars.

- Valley Railroad Company (VRR) operates between Old Saybrook and Haddam along the right-of-way owned by the Connecticut Department of Environmental Protection. Priority repairs for VRR include the restoration of a 10-mile dormant segment of the line and track and bridge improvements along the remainder of the corridor.



This image shows NAUG crosstie insert machine making repairs.

The proposed projects for VRR and the PW Middletown Secondary are along the same freight rail corridor and when completed, will provide an alternate route for freight rail movements between Old Saybrook and Hartford via Middletown that does not currently exist. This new route will remove freight rail traffic from the Northeast Corridor between Old Saybrook and New Haven as well as along the Hartford Line between New Haven and Hartford. It will also reduce freight shipment miles by 22.7 miles by traveling from Old Saybrook to Middletown to Hartford (44.6 miles) versus Old Saybrook to New Haven to Hartford (67.3 miles). This will not only reduce the short line operating cost as a result of reduced travel miles and avoidance of access fees on the Northeast Corridor, but it will also reduce congestion on the Northeast Corridor and benefit passenger rail that shares that corridor.

The project proposed within this application are for the BSRR to replace one locomotive and repower a second locomotive for use along their 7.2 mile rail line in the Branford area. The existing main line locomotive, a 1976 Electro-Motive Design (EMD) SW1001, will be replaced with a new BL14CG CoGeneration locomotive that will exceed Tier II standards. The current switcher locomotive, a 1984 GE diesel electric class B-B 85 ton locomotive, will be replaced with a repowered version of the current EMD SW 1001 engine locomotive. The SW1001 will be repowered with a two engine CoGeneration conversion package. The project will also include replacement of 40 100-ton hopper railcars for interchange use to replace existing cars which were constructed in 1964.

Addressing Urban and/or Rural Area Needs

The statewide freight rail system navigates through both urban and rural populations. The projects address needs critical to both areas through implementing quick turnaround strategies for modernizing operations, thereby creating a more efficient system and improving safety. These steps will ensure the continued movement of freight into and out of urban and rural areas in Connecticut and throughout the surrounding region.

Freight rail improvements will foster economic growth and development in the state. Connecticut has nine municipalities that are categorized as Economically Distressed Areas (EDAs) within the eight Comprehensive Economic Development (CED) regions. The municipalities include Bridgeport; New Britain; Waterbury; New Haven; New London; Hartford; East Hartford; Torrington; and Windham. Per the U.S. Census Bureau Factfinder (2007), these municipalities either have a per capita income that is less than 80 percent of the national per capita income or have unemployment rates that are at least 1 percent greater than the national unemployment rate. Four of the seven projects serve an EDA. Furthermore, the freight railroad industry as a whole is in distress and needs the proposed improvements and upgrades to regain its place in the market and be able to maintain its current levels of employment.

Transportation Challenges that the Project Aims to Address

The infrastructure improvements to the freight rail system seek to address the transportation challenge of moving freight in a cost effective, sustainable, and timely manner. Achieving this includes:

- Increasing load-bearing capabilities of rail bridges
- Decreasing travel times and operating costs
- Improving rail-to-rail connections
- Improving port-to-rail connections

Attaining travel time reductions and increases in load-bearing capabilities of rail bridges to be competitive with alternate modes of freight movements, specifically trucking goods on congested highways, is critical to the growth and success of the state's freight rail network. The proposed improvements and repairs will enable portions of the rail network to handle a 286,000 pound rail car load, while ensuring that the remaining portions of the network will continue to handle this load. While some vertical clearance projects have been funded by the freight operators, RailAmerica completed one on the NECR Palmer Line and PW completed one on the Norwich Line (Plainfield Secondary), additional increases to vertical clearances are needed within the network to accommodate modern loading practices and will be included as

part of this project. Connecticut's freight rail system needs updates and infrastructure improvements in order to be economically competitive in facilitating the movement of goods into and through the state, specifically in comparison to transporting cargo via trucks.



This image shows the first Connecticut double-stack container, operated by RailAmerica, Inc. Increased vertical clearances enable double-stack containers, which increase shipment volumes.

Transportation is a major consumer of energy and a significant contributor of carbon dioxide emissions, both of which are a factor in the rise in green houses gases and resultant climate changes that are increasingly causing concerns globally. Moving freight by rail results in fewer carbon emissions and green house gases due to the amount of truck trips one freight train can displace. This then results in decreased congestion on the highway network and improved safety measures on the roadway. The roadway network becomes safer as a result of less traffic congestion overall, as well as fewer trucks.

D. Project Parties

The primary project parties are the State of Connecticut and the Connecticut Department of Transportation. The Branford Steam Railroad (BSRR) is another important project party since they own and/or operate freight rail over the portion of the state's freight rail network that is being considered. The State of Connecticut (www.ct.gov) would be the official grant recipient, and the Connecticut Department of Transportation (ConnDOT) (www.ct.gov/dot) would be administering the grant funds and managing the project in partnership with BSRR.

E. Grant Funds and Sources and Uses of Funds

The Connecticut Department of Transportation is seeking 100% funding for the proposed improvements and repairs identified in this application for each of the seven freight rail operators. These funds are intended to leverage the \$282.5 million the state has invested in the freight rail network over the past ten years. The receipt of the requested funding from the TIGER Discretionary Program, which is significantly less than the \$282.5 million investment already made by the state, will provide the much needed incremental funding to completely address priority improvements in the system.

Another \$1.56 billion has been invested by the state in the New Haven Main Line for infrastructure improvements, such as track, signals and power, and bridges. This work provides a secondary benefit to freight rail because it allows the freight rail trains that operate on the New Haven Line to increase their operating speeds, reducing transit times. In total, the TIGER Discretionary Program requests represent a small portion of the total state rail investment but will provide tremendous benefit through renewed connectivity and increased productivity to the state rail freight system.



This image shows the construction work on the Waterfront Street Rail Extension at the Port of New Haven.

The improvements and repairs proposed for TIGER funding will benefit approximately three-fourths of the statewide freight rail network at an investment that is significantly lower than previous investments made by ConnDOT for the freight rail system.

F. Selection Criteria Compliance

Continuing to improve the statewide freight rail network is consistent with the goals and objectives of the TIGER Grant funding.

1. Primary Selection Criteria

a. Long-Term Outcomes

- › **State of Good Repair:** The proposed repairs and/or improvements to the statewide freight rail network will minimize life cycle costs, as operational efficiency will be improved and new equipment will require less fuel and maintenance. Right-of-way work and tie and rail replacements will return portions of the network to a State of Good Repair. In addition, the removal of trucks from the state highway system will extend the life cycle of roads and bridges by reducing the wear and tear caused by frequent truck traffic. These improvements coincide with the State Rail Plan and rehabilitate portions of the rail line that urgently require attention to avoid threatening their economic future.
- › **Economic Competitiveness:** The projects proposed for the statewide freight rail network will provide long-term contributions to growth in employment, as well as the more efficient movement of goods, which results in cost competitiveness. Repair and replacement of equipment and track will increase operating speeds and reduce the cost of moving freight. The connection of the Middletown Secondary and the Valley Railroad will reduce operating costs via reduced travel miles and access fees by avoiding a section of the Northeast Corridor. These changes will reduce costs for the freight operator and the supplier, thereby making goods more cost competitive in the marketplace. Job growth will continue beyond the duration of construction, as the improved operations will result in additional positions with the freight operator, positions with suppliers who will be able to move more cargo, and follow on positions in other regions as a result of increased operations.
- › **Livability:** The repairs and/or improvements to the statewide freight rail system will significantly improve the availability of goods to the state, including nine municipalities designated as EDAs. The proposed projects will take truck traffic off of the roads on the arterial and interstate roadway system, thereby reducing congestion and emissions. This will also make the roadway network safer for drivers, particularly senior citizen drivers who may be averse to driving alongside trucks. The engines on the proposed new equipment will exceed the Tier II emissions standards and also reduce noise associated with the movement of the freight trains. The combined efforts of VRR and PW will provide an alternate route for freight rail movements between Old Saybrook and Hartford, which will reduce freight rail traffic on the NEC, thus benefiting passenger rail traffic on that corridor.
- › **Sustainability:** The proposed repairs and improvements to the statewide freight rail network will improve energy efficiency through improved operating speeds and by permitting the through routing of the modern rail car. Replacing outdated and inefficient equipment will reduce the operators' dependence on oil, since they will be traveling the same distance using less fuel. The projects contribute to a decrease in the movement of goods by less energy efficient vehicles by providing strengthened bridges and cleared routes for 286,000 pound rail car loads and double stack shipments. The proposed projects also avoid adverse environmental impacts since they are simply replacing or repairing existing infrastructure and equipment. Environmental benefits include decreased green house gas emissions and improved air quality, as a result of replacing old and inefficient equipment, and the subsequent reduction in truck trips from the highway network.
- › **Safety:** Removing truck traffic from the arterial and interstate roadway system will improve the overall safety of the roadway system. Studies have shown and concluded that a reduction in truck traffic will increase the overall safety of roadway facilities. Improvements and repairs to at-grade railroad crossings throughout the statewide freight rail system will make these crossings safer for pedestrians, vehicles, and trains.
- › **Evaluation of Benefit Cost Analysis:** The benefits associated with the proposed improvements and repairs will result in travel and transit time savings, improved operations and safety, removal of trucks from highways, reduced emissions and green house gases, and an increase in the use of freight rail, more than substantiating the costs .
- › **Evaluation of Project Performance:** Key criteria will be tracked and reported accordingly to effectively evaluate the performance after the proposed repairs and improvements have been implemented.

b. Job Creation and Economic Stimulus

Using the standard formula for stimulus job creation, 2,180 new jobs will be created as a result of the total project investments on the statewide freight rail network. The majority of the created jobs will be in the construction trade workforce. Additional positions will be created within the freight companies as a result of expanded coverage or and increased volume of shipments. Follow on jobs within and outside of the region as a result of the increased operations will also be created, although these are not accounted for in the estimated total.

- › **Project Schedule:** The projects are ready to start construction immediately upon receipt of a TIGER Grant, and the monies will be steadily spent throughout construction, with the projects being completed by February 2012.

- › **Environmental Approvals:** All work will be completed within the existing right-of-way; no new approvals are anticipated as part of the proposed work.
- › **Legislative Approvals:** Legislative approval is not needed for the proposed work.
- › **State and Local Planning:** The proposed improvements are consistent with the Statewide Rail Plan and the business plans for each of the individual freight line operators. Furthermore, the improvements are being incorporated into the Connecticut TIP per the Commissioner's letter located at: http://www.ct.gov/dot/lib/dot/documents/dcommunications/stimulus/tiger/freightrail/Inclusion_Document_for_STIP.pdf.
- › **Technical Feasibility:** All of the projects consist of typical railroad construction techniques, materials, and equipment. None of the proposed repairs or improvements is contingent upon the completion of another project. The projects coincide with the State Rail Plan and are ready for immediate implementation.
- › **Financial Feasibility:** Cost estimates have been prepared as shown in each application. TIGER Grant funding is necessary for the implementation of each of these projects.

2. Secondary Selection Criteria

- › **Innovation:** The proposed improvements include replacing outdated locomotives and rail cars. This will not only ensure significantly reduced emissions, but it will also reduce fuel consumption. The new locomotives are innovative in their design, featuring power on demand engine systems, regenerative dynamic braking, a smokeless start engine, and clean emissions through a clean-burning MOH Tier 3 Engine with self-cleaning ceramic particulate filters.
- › **Partnership:** The State of Connecticut is fully supportive of each individual project and has worked individually and collaboratively with each of the freight rail operators towards the overall goal of creating an efficient and effective regional freight rail system that plays an integral role in the overall transportation infrastructure and Connecticut in the region.

G. Federal Wage Requirement

ConnDOT certifies that it will be in compliance with the requirements of subchapter IV of chapter 31 of title 40, United States Code (Federal wage rate requirements), as required by the Recovery Act. A letter from the Commissioner, stating ConnDOT's compliance with the Federal Wage Requirement, is located at: http://www.ct.gov/dot/lib/dot/documents/dcommunications/stimulus/tiger/Federal_Wage_Certification_082509.pdf.

H. National Environmental Policy Act (NEPA) Requirement

None of the proposed improvements or repairs will significantly impact the natural, social, and/or economic environment. As the projects involve replacement of existing equipment or track components and repairs to existing structures, they are anticipated to fall within Federal Railroad Administration's Categorical Exclusion (CE) category under the NEPA protocol.

I. Environmentally Related Federal, State, and Local Actions

None of the projects for the statewide freight rail network will require actions by other agencies, as the projects include replacement and/or repairs to existing rail equipment and infrastructure.

J. Protection of Confidential Business Information

Information provided in ConnDOT's TIGER Discretionary Grant application is public information and is not considered confidential.

IX. Reporting Requirements

ConnDOT understands that entities receiving TIGER Discretionary Grants will be required to report on grant activities on a routine basis. Reporting categories include maintenance of effort, reports on use of funds, and environmental reporting. ConnDOT ensures that the appropriate reporting would be submitted in conjunction with the Grant Funding.

X. Certification Requirements

ConnDOT understands that it must comply with the Certification requirements of the Recovery Act.

The following section includes the project specific portion of the application for the Branford Steam Railroad.

Project Title

Replacement and Repowering of Locomotive Engines for BSRR & TLTX Railcar Replacements

Contact Information

Tilcon Connecticut Inc.
Chip Hammarlund, Superintendent
1 Forest Road
North Branford, Connecticut 06471
Phone: (203) 484-1407
Fax: (203) 484-1426
Email: chammarlund@tilcon-inc.com

TIGER Funding Requests

\$1,630,000 – New Brookville 115-Ton CoGeneration Locomotive
\$1,425,000 – Repower Existing SW1001 Locomotive with 2-Engine CoGeneration Conversion
\$3,400,000 – Replacement of 40 (100 Ton) Interchange Hopper Railcars
\$6,445,000 – Total Funding Requests

Project Period

September 2009 to October 2011

Multiple Projects

1. Replacement of main line locomotive with new Brookville 115-ton CoGeneration Locomotive
2. Repowering existing SW1001 switcher locomotive with 2-Engine CoGeneration Conversion
3. Replacement of 40 (100 Ton) interchange hopper railcars

Project Summary/Approach

The Branford Steam Railroad submits this grant proposal for the Transportation Investment Generating Economic Recovery Program. This proposal will assist Branford Steam Railroad (“BSRR”) by providing a significant source of funding for the replacement and repowering of two locomotive engines in the Branford area. Also being requested is the replacement of forty 100 ton capacity hopper cars for interchange use. Securing federal funding assistance would help BSRR with the needed capital to replace these older engines with much cleaner models, ensure continued rail freight transportation needs, which both could not be accomplished without the needed capital.

Branford Steam Railroad is an industrial railroad serving the Tilcon Connecticut stone quarry in North Branford, Connecticut. It exchanges freight with the Providence and Worcester Railroad and with the Buchanan Marine Company.

BSRR operates three locomotive engines that currently assist in the transportation of construction aggregates between the North Branford and Branford area for barge delivery. These locomotives travel along a 7.2 mile track that helps transport over one million tons of construction aggregates a year that support public and private construction in the New York tri-state area. This project seeks to replace the main line locomotive, a 1976 Electro-Motive Design (EMD) SW1001 train, with a new BL14CG CoGeneration locomotive that would exceed Tier II standards. The current switcher locomotive, a 1984 GE diesel electric class B-B 85 ton locomotive, would be replaced with the repowering of the current EMD SW1001 engine locomotive with a two engine CoGeneration conversion package. The improvements would all be performed by Brookville Equipment Corporation located in Brookville, Pennsylvania, and would help the company create and retain jobs.

The current main line locomotive operates approximately 5,000 hours per year, consumes 20,600 gallons of low sulfur diesel fuel annually, travels 17,900 miles annually, and is not regulated by current locomotive emission standards. The switcher locomotive operates approximately 1750 hours per year, consumes 5,700 gallons of low sulfur diesel fuel annually, travels 11,900 miles annually, and is also not regulated by current locomotive emission standards.

These CoGeneration locomotives utilize a process where power is generated by two simultaneous Genset engines or an individual engine to achieve the maximum power efficiency and produce minimum emissions. Regenerative dynamic braking would also be used along the rail line that would generate energy that is recycled for use in auxiliary functions such as fans, lights, radios, and air compressors. Each engine features smokeless starts and power on demand technologies that can reduce fuel consumption by 25% and limit excess noise when power demand is low.

The increased tractional horsepower available to the new model switcher locomotive would reduce the hauling time requiring two locomotives. A reduction of 6,000 miles per year of travel for each locomotive could be achieved with a resulting reduction of fuel consumption and emissions released. This would also result in reduced cycle times for freight transportation.

For both projects, these new locomotive engines would be in operation for at least 20 years, leading to sustainable emissions reductions for the long-term in Connecticut.

The replacement of 40 100 ton hopper cars for interchange use would help ensure freight transportation by rail throughout the states of Connecticut and New York. The existing cars, constructed in 1964, are reaching the end of their 50 year life-span, and if they are not replaced could require alternate means of transportation necessary for freight.

These railcars currently ship construction aggregates from the Tilcon Connecticut stone quarry, located in Wallingford, Connecticut, to the Danbury area. Approximately 400,000 tons of construction aggregates are transported yearly supporting public and private construction in Connecticut and New York. In 2008, roughly 3,700 railcars were shipped from Wallingford to Danbury, which if needed to be hauled by tri-axial truck would be equivalent to over 14,500 one-way truckloads. Providence and Worcester Railroad provides transportation of these railcars that travel through Fairfield County, which is a designated non-attainment area for the annual fine particulate matter (PM) National Ambient Air Quality Standards (NAAQS). It is critical to retain the rail haulage through this area as alternate means of transportation could negatively contribute to the NAAQS.

Project Timeline

<i>Date</i>	<i>Activity</i>
September 2009	If awarded, prepare schedule for the purchase of a new locomotive and repowering of the current main line locomotive engine.
October 2009	Initiate Grant Agreements & Project Scope of Work
October 2009	Start with construction of new CoGeneration locomotive from Brookville Equipment Corporation and construction of 40 hopper railcars.
August – October 2010	Delivery of new CoGeneration locomotive and begin repowering of EMD SW1001 locomotive with 2-engine CoGeneration conversion.
August – October 2011	Delivery of repowered EMD SW1001 locomotive with new CoGeneration conversion. Replacement complete for 40 total hopper railcars.

Project Benefits

Currently, the entire state of Connecticut has been designated as non-attainment for the ozone NAAQS. This designation means that the air quality in our state exceeds the limits for ozone and particulate matter established by EPA. This requires strategies designed to reduce emissions of nitrogen oxides (NO_x), volatile organic compounds (VOCs), hydrocarbons (HC), and particulate matter (PM).

The operation of CoGeneration locomotives would greatly reduce the amount of emissions being reduced each year and help the long term goals of sustainability in reductions in emissions, fuel consumption, and decreasing the movement total required of each locomotive. Operating locomotives that produce the cleanest emissions would contribute to Connecticut's goals of reducing annual emissions, such as encouraging vehicles that meet stringent emissions standards and maximizing the opportunities for achieving emission reduction from rail based on the Connecticut Clean Diesel Plan of 2006. Estimates generated by the USEPA's Diesel Emissions Quantifier (DEQ) model found the new engines could reduce emissions of NO_x by 21.5 tpy, PM by 0.75 tpy, and HC by 2.01 tpy.

Anticipated Outputs and Outcomes		
Activities	Outputs	Short, Medium, and Long-Term Outcomes
Replacement of one engine locomotive and repowering of another switcher engine locomotive.	Replacement of two unregulated locomotive engines with CoGeneration Genset engines that meet Tier II standards.	<p>Short-term: Successful replacement of 2 old locomotive engines with new ultra-clean engines.</p> <p>Medium-term: Emissions Reduction = Reduce 0.75 tons per year (typ) of PM, 21.5 tpy of NO_x, and 2.01 tpy of HC.</p> <p>Long-term: Reduce locomotive emissions in Connecticut and noise in and around rail yards.</p>

The tables below individual project total cost effectiveness estimates generated by the USEPA's Diesel Emissions Quantifier. The Genset engines are expected to reduce fuel usage and therefore decrease CO₂ emissions, which do not reflect the total cost effectiveness below.

Project Emissions Reductions and Cost Effectiveness Estimates			
BSRR Main Line Replacement	NO _x	PM	HC
Emissions Reductions (tpy)	18.3	0.64	1.71
Total Cost Effectiveness (\$/ton)	\$2,964	\$84,543	\$31,744

Project Emissions Reductions and Cost Effectiveness Estimates			
BSRR Switcher Replacement	NO _x	PM	HC
Emissions Reductions (tpy)	3.20	0.11	0.30
Total Cost Effectiveness (\$/ton)	\$9,889	\$282,057	\$105,908

We are encouraging for the collaboration and support of agencies such as the Connecticut DEP with the continued emphasis on retrofitting initiatives that would be achieved through such an investment. We would greatly appreciate the opportunity to be an example of the required change in transportation culture in Connecticut.

The replacement and repowering of the two locomotives would allow for the creation and sustainment of jobs for Brookville Equipment Corporation in Brookville, Pennsylvania. An estimated 61 jobs could

benefit from the \$3,055,000 investment in locomotive engine replacements with this rail infrastructure spending.

Rail hopper car replacement would ensure the continued use of rail as the primary means of transportation for construction materials such as aggregates. The replacement of forty 100 ton hopper railcars could allow for the creation and sustainment of 68 jobs with the \$3,400,000 capital funding in rail infrastructure. This project emphasizes the need to rehabilitate and maintain the current transportation services that are available in Connecticut. A deteriorating rail car fleet would only threaten the continued future economic growth in infrastructure spending in Connecticut and New York.

Additional Data

New CoGeneration Locomotive & Repower Current Locomotive to CoGeneration Conversion

- Track Length (mileage) in Connecticut
 - 7.2 mi including sidings and in-plant rail
- Average daily/annual mileage per train
 - Mainline Locomotive: 17,892 mi (2008 Annual)
 - Switcher Locomotive: 11,928 mi (2008 Annual)
- Approximate number of railcar shipments annually that are/will be diverted from truck to rail
 - Not applicable
- Anticipated year service will be operable, if new, or if existing service, the year service is anticipated to be completely upgraded
 - August 2010 for Replacement Locomotive & August 2011 for Repowering of Existing Locomotive
- Are current truck trips one-way, two-way. What percentage of truck trips are one-way, percentage two-way (used to determine highway miles reduced and diverted to rail), if known.
 - Not applicable
- Number of new/additional rail cars added to start this service (if no new rail cars, how many are currently in service now)
 - Not applicable
- Approximate number of gallons of fuel consumed per day for rail freight service
 - Mainline Locomotive: 20,572 gal/year
 - Switcher Locomotive: 5,695 gal/year
- If service is already existing, and no new or additional railcars are being added, is the speed of the rail line increased? If so, need average current speed and anticipated speed after improvement as well as the daily/annual number of railcars affected. Does increased speed reduce or increase the average number of gallons of fuel consumed by day? If speed affects fuel consumption, give difference in gallons or percent change.
 - There would be no speed increase, but an approximate decrease of 2 miles per trip for both the mainline and switcher locomotives. The power requirements needed for transportation would be fulfilled by a single operating locomotive. A total approximate reduction of 5,964 miles would be achieved through the improvements.
- Will increase in track speed reduce any truck traffic from highways? If so, anticipated number of trucks, mileage reduced
 - Not applicable
- Copies of correspondence (emails) from rail operators detailing any of the above information (will be attached as part of the analysis package). Source of data needs to be cited where possible.
 - Will be attached in proposal
- Distinguish which ones are new rail service and which are improvements to existing service. For new service, why are the rail lines currently not being used? For example, are they outdated, no longer usable, have not been maintained, overlaid with asphalt, overgrown, etc.
 - Not applicable
- Will these improvements result in rail interconnecting with intermodal facilities?
 - Not applicable

Replacement of 40 (100 Ton) Hopper Cars for Interchange Use

- Track Length (mileage) in Connecticut
 - Approximately 58 miles
- Average daily/annual mileage per train
 - Providence and Worcester Railroad Operates, Values Not Known
- Approximate number of railcar shipments annually that are/will be diverted from truck to rail
 - In 2008, we shipped 3,646 TLTX interchange railcars from Wallingford to Danbury, which would be equivalent to 14,585 one-way truckloads.
 - Approx. 4 Truckloads / Railcar
- Anticipated year service will be operable, if new, or if existing service, the year service is anticipated to be completely upgraded
 - Completion of 40 railcar replacements by October 2011
- Are current truck trips one-way, two-way. What percentage of truck trips are one-way, percentage two-way (used to determine highway miles reduced and diverted to rail), if known.
 - One-way trips
- Number of new/additional rail cars added to start this service (if no new rail cars, how many are currently in service now)
 - Currently there are 34 captive railcars on BSRR and 184 TLTX interchange hopper cars, 40 of which are proposed to be replaced due to age.
- Approximate number of gallons of fuel consumed per day for rail freight service
 - Providence and Worcester Railroad Operates, Values Not Known
- If service is already existing, and no new or additional railcars are being added, is the speed of the rail line increased? If so, need average current speed and anticipated speed after improvement as well as the daily/annual number of railcars affected. Does increased speed reduce or increase the average number of gallons of fuel consumed by day? If speed affects fuel consumption, give difference in gallons or percent change.
 - Not applicable
- Will increase in track speed reduce any truck traffic from highways? If so, anticipated number of trucks, mileage reduced
 - Not applicable
- Copies of correspondence (emails) from rail operators detailing any of the above information (will be attached as part of the analysis package). Source of data needs to be cited where possible.
 - Will be attached in proposal
- Distinguish which ones are new rail service and which are improvements to existing service. For new service, why are the rail lines currently not being used? For example, are they outdated, no longer usable, have not been maintained, overlaid with asphalt, overgrown, etc.
 - Not applicable
- Will these improvements result in rail interconnecting with intermodal facilities?
 - Not applicable

CoGeneration™ Locomotives

A new generation of motive-power for your fleet

CoGeneration™ - A process where power is generated by two or more sources simultaneously or individually to achieve maximum efficiency and minimum emissions.

Pictured Left:
Model BL14CG →



Pictured Below:
Model BL20CG →



Regenerative Dynamic Braking BEC's regen braking allows the use of the DB brakes (down to 0.6 mph) to generate energy that is recycled for use in auxiliary functions like cab heating, fans, air conditioning, lights, radios, refrigerator, and air compressor.

Smokeless Start - Each engine is started by the generator to a high speed before fuel is introduced. This configuration also eliminates the maintenance from normal wear on starters and ring & pinion gears.

Power on Demand - Feature utilizes engine shut-down that can reduce fuel consumption by 25% and limit excess noise when power demand is low. As Power Demand increases, additional engine(s) comes on-line to provide up to 2100hp (total). Optional power source options may also include battery third rail or catenary input sources.

Cleanest Emissions - Through a combination of clean-burning MOH Tier 3 engines and optional self-cleaning ceramic particulate filters, Hydrocarbon emissions are reduced 97%, NOx reduced by 65%, CO reduced 75%, and Particulate Matter reduced by 93%.

MODEL	BL20CG	BL14CG	BL20CGC
Wheel arrangement:	B-B	B-B	C-C
Engine(s) *:	(3) Cummins QSK19C 19L*	(2) Cummins QSK19C 19L*	(3) Cummins QSK19C 19L*
Traction Motors:	4 x D78	4 x D78	6 x D78
Traction Horsepower:	2000	1300	2000
Maximum Speed:	66	66	66
Starting Tractive effort:	86,400 Lbs	83,200 Lbs	100,000 Lbs
Adhesion:	32%	32%	32%
Weight (fully serviced):	270,000 Lbs	260,000 Lbs	320,000 lbs
Fuel Capacity:	2500 gal	gal	3000 gal
Regenerative Braking	50,000 Lbs	50,000 Lbs	75,000 lbs
Exhaust Treatment	Optional DPF / DOC	Optional DPF / DOC	Optional DPF / DOC
Head End Power	Optional	Optional	Optional
Zero fuel consumption during regen braking	yes	yes	yes

* This engine standard, other engines available



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a_pinchock@BrookvilleEquipment.com



Email

To: Mr. Chip Hammarlund	From: Amy Pinchock / Sales Assistant
Email: chammarlund@tilcon-inc.com	Pages: 1
Phone: 203-484-1407	Date: August 25, 2009
Re: Budgetary Quotation # 848	CC:

Urgent For Review Please Comment Please Reply Please Recycle

Thank you for your interest in Brookville Equipment Corporation. The following is budgetary pricing for a 2-engine Cogeneration™ locomotive and refurbishment/remanufacture of SW1001 conversion to a 2-engine genset locomotive.

LD11502AH

New Brookville 115-Ton CoGeneration™ Locomotive with Two QSK19L Cummins engines rated at 700hp each, Marathon alternators, D78 Traction motors (remanufactured), remanufactured truck frames, TMV Excitation and Traction Control System, new Brookville manufactured frame, and Wabco 26-L brake system.

@ \$1,630,000.00 each

SW1001 Conversion to 2-Engine CoGeneration Package

Remanufacture of customer-supplied SW1001 to replace existing locomotive components with Two QSK19L Cummins engines rated at 700hp each, Marathon alternators, D78 Traction motors (remanufactured), remanufactured truck frames, TMV Excitation and Traction Control System, and Wabco 26-L brake system.

@ \$1,425,000.00 each

All prices are stated in U.S. Dollars, Ex-Works, Brookville, PA. Note: Shipping of conversion does not include transportation from New Britain, CT to Brookville. All prices are valid for a period of 30 days.

Please Note: Brookville reserves the right to adjust selling price if market conditions change drastically from the time of order until time of completion (based on Producer's Price Index). This includes the possibility of a steel/metal surcharge if market conditions dictate. This adjustment would be negotiated on a case-by-case basis with customer input.

Please contact us when a formal proposal is required.





State of Connecticut
 Department of Environmental Protection
 79 Elm Street
 Hartford, CT 06106-5127
www.ct.gov/dep

Connecticut's Transportation and Air Quality Challenges

Air Quality Requirements

In accordance with the federal Clean Air Act, the U.S. Environmental Protection Agency (EPA) establishes health-based National Ambient Air Quality Standards (NAAQS) for certain pollutants. Once EPA sets a standard, states must submit State Implementation Plans (SIPs) to attain and maintain air quality at levels below the NAAQS. Currently, the entire state of Connecticut has been designated as non-attainment for the ozone NAAQS. Fairfield and New Haven Counties have been designated as non-attainment for the annual fine particulate matter (PM_{2.5}) NAAQS. The non-attainment designation means that the air quality in our state exceeds the limits for ozone and PM_{2.5} established by EPA.

Over the years, EPA has gradually tightened the health-based standards for ozone and PM in light of advancing scientific information regarding the potential health impacts of these pollutants. In October 2006, EPA issued a more stringent 24-hour standard for PM_{2.5}. Connecticut has recommended to EPA that Fairfield and New Haven Counties be designated, again, as non-attainment for the new, more stringent 24-hour PM_{2.5} standard. EPA is required, under a court order, to make final designations before the end of 2008. Most recently, in March 2008, EPA finalized a more stringent 8-hour ozone standard. Connecticut expects to recommend a statewide nonattainment designation to EPA by March 2009. EPA is scheduled to make final designations for the new ozone NAAQS by March 2010.

Under federal law, Connecticut must identify legally binding strategies to attain the federal NAAQS. Failure to attain the federal health-based standard within prescribed time frames, and failure to maintain that level of air quality once achieved, can result in sanctions, including the loss of federal highway funds.

Connecticut's non-attainment status for ozone and particulate matter requires strategies designed to reduce emissions of nitrogen oxides (NO_x), volatile organic compounds (VOCs), sulfur dioxide (SO₂) and PM_{2.5}. The mobile source sector, which includes cars, trucks, buses, locomotives, construction equipment, and marine engines, is a significant source of these pollutants. The state has recognized that diesel-powered engines produce black carbon, a significant contributor to global warming, and emissions of toxic air pollutants, along with carbon dioxide and PM_{2.5}. Therefore, minimizing vehicle miles traveled (VMT) for the on-road sources, is an important strategy to improve Connecticut's air quality.

State efforts to address Climate Change consider the substantial contribution of mobile sources to the state's total annual emissions of the greenhouse gas, carbon dioxide. The Global Warming Solutions Act calls for a minimum of an 80% reduction of greenhouse gas emissions from 2001 by 2050. Success in achieving this goal will require draconian measures directed at stationary, area and mobile sources, of which mobile sources will be a significant focus. There are many mobile source options available that have not yet been fully realized, but their implementation will require a change in the transportation culture of Connecticut.

Transportation Strategies

State-wide plans have been developed as part of an integrated approach to addressing air quality impacts from transportation sources. These plans include the Climate Change Action Plan, The Governor's Energy Plan, the Connecticut Clean Diesel Plan, and the Global Warming Solutions Program, as well as the state's on-going SIP development. Key transportation initiatives identified in these plans include:

- Reducing VMTs by 3% below anticipated 2020 levels of approximately 110 million VMT per day through identification of innovative VMT management opportunities including:
 - Encouraging transit, bicycle and pedestrian components for the strategic transportation network;¹ and
 - Conducting feasibility studies for congestion pricing, and using location efficient mortgages to encourage shorter commutes;¹
- Encouraging inclusion of climate modeling data in repair/replacement of transportation infrastructure;^{1,4}
- Encouraging acquisition of vehicles meeting stringent emissions standards and using cleaner fuels (Cal LEV II, low GHG, Ultra-Low Sulfur Diesel);^{1,2}
- Implementing rail service between New Haven-Springfield;^{1,4}
- Implementing the New Britain-Hartford and Hartford East Bus Rapid Transits;¹
- Moving forward on the I-95 Corridor Coalition-Freight Initiative;¹
- Reducing emissions from legacy fleets, in the transit, construction, school bus and motor transport sectors (some 40,000 vehicles in Connecticut) by means of:
 - Aggressive transition to newer, cleaner fleet vehicles;^{1,2,3}
 - Exploration of creative financing or incentives for retrofits;^{1,2} and
 - Developing financing options for stationary and on-board idle reduction technologies;^{1,2}
- Enhancing education and enforcement of the state's existing anti-idling strategy;²
- Maximize opportunities for achieving emission reduction from ports, rail and airports;²
- Establishing incentive program to encourage clean technologies such as:
 - Construction of biofuels production facilities;³
 - Installation of alternate energy fuel pumps;^{1,3} and
 - Advocating for expanded fuel cell research;^{1,3}
- Decrease dependence on fossil fuels by reducing consumption by 20% by using alternate fuels;³
- Evaluating the use of low carbon fuel standards, which take into account the energy used and emissions produced in processing fuels;⁴ and
- Investigating potential improvements in the state and regional transportation system that will reduce greenhouse gas emissions.^{1,4}

Areas for Interagency Collaboration

DEP is developing opportunities to implement work with other agencies to reduce emissions through such activities as:

- Using CMAQ funding for mitigation of diesel emissions;
- Continuing emphasis on retrofitting initiatives; and
- Planning for achieving multipollutant emission reductions from diesel trucks.

Ongoing diesel reduction efforts that advance DEP's implementation of the Clean Diesel Plan:

- DOT is retrofitting or replacing the 477 transit buses discussed in the Clean Diesel Plan.
- DOT has retrofit pieces of 104 construction equipment at the Q Bridge through specifications in contracts and is exploring other opportunities to expand the program.
- DPW has adopted DOT's retrofit specifications and is including them in construction contracts.

1: Based on goals in Connecticut's Climate Change Action Plan of 2005.

2: Based on goals in Connecticut's 2006 Clean Diesel Plan.

3: Based on goals in the Governor's Energy Vision 2006.

4: Based on goals in the 2008 Connecticut Global Warming Solutions Act.

Main Line Locomotive Engine Replacement Data

Annual	NOx (tons/year)	PM (tons/year)	HC (tons/year)	CO (tons/year)	CO2 (tons/year)	Diesel-Equivalent (gallons/year)
Baseline of Entire Fleet	58.5327	1.2296	3.1416	10.0861	228.66	20,600.00
Baseline of Vehicles	58.5327	1.2296	3.1416	10.0861	228.66	20,600.00
Retrofitted Percent Reduced (%)	31.30%	52.20%	54.40%	0.00%	0.00%	0.00%
Amount Reduced Per Year	18.2984	0.6415	1.7086	0	0	0
Daily	NOx (kg/day)	PM (kg/day)	HC (kg/day)	CO (kg/day)	CO2 (kg/day)	Fuel (gal/day)
Kilograms Reduced Per Day (kg/day)	45.4795	1.5945	4.2466	0	0	0
Lifetime	NOx (tons)	PM (tons)	HC (tons)	CO (tons)	CO2 (tons)	Diesel-Equivalent (gallons)
Baseline of Entire Fleet	1,769.85	37.1803	94.9922	304.9749	228.66	20,600.00
Baseline of Vehicles	1,769.85	37.1803	94.9922	304.9749	228.66	20,600.00
Retrofitted Percent Reduced (%)	31.30%	52.20%	54.40%	0.00%	0.00%	0.00%
Amount Reduced	553.2877	19.3984	51.6624	0	0	0
Amount Emitted After Retrofit, Retrofitted Vehicles	1,216.57	17.7819	43.3298	304.9749	228.66	20,600.00
Amount Emitted After Retrofit, Entire Fleet	1,216.57	17.7819	43.3298	304.9749	228.66	20,600.00
Capital Cost Effectiveness (\$/ton), Retrofitted Vehicles	\$2,964.10	\$84,543.05	\$31,744.55	\$0.00	\$0.00	\$0.00
Total Cost Effectiveness (\$/ton), Retrofitted Vehicles	\$2,964.10	\$84,543.05	\$31,744.55	\$0.00	\$0.00	\$0.00

Switcher Locomotive Engine Replacement Data

Annual	NOx (tons/year)	PM (tons/year)	HC (tons/year)	CO (tons/year)	CO2 (tons/year)	Diesel-Equivalent (gallons/year)
Baseline of Entire Fleet	10.2432	0.2152	0.5498	1.7651	62.16	5,600.00
Baseline of Vehicles	10.2432	0.2152	0.5498	1.7651	62.16	5,600.00
Retrofitted Percent Reduced (%)	31.30%	52.20%	54.40%	0.00%	0.00%	0.00%
Amount Reduced Per Year	3.2022	0.1123	0.299	0	0	0
Daily	NOx (kg/day)	PM (kg/day)	HC (kg/day)	CO (kg/day)	CO2 (kg/day)	Fuel (gal/day)
Kilograms Reduced Per Day (kg/day)	7.9589	0.279	0.7432	0	0	0
Lifetime	NOx (tons)	PM (tons)	HC (tons)	CO (tons)	CO2 (tons)	Diesel-Equivalent (gallons)
Baseline of Entire Fleet	460.9453	9.6833	24.74	79.4284	288.05	25,950.45
Baseline of Vehicles	460.9453	9.6833	24.74	79.4284	288.05	25,950.45
Retrofitted Percent Reduced (%)	31.30%	52.20%	54.40%	0.00%	0.00%	0.00%
Amount Reduced	144.0996	5.0522	13.4551	0	0	0
Amount Emitted After Retrofit, Retrofitted Vehicles	316.8456	4.6312	11.2849	79.4284	288.05	25,950.45
Amount Emitted After Retrofit, Entire Fleet	316.8456	4.6312	11.2849	79.4284	288.05	25,950.45
Capital Cost Effectiveness (\$/ton), Retrofitted Vehicles	\$9,888.99	\$282,057.11	\$105,907.90	\$0.00	\$0.00	\$0.00
Total Cost Effectiveness (\$/ton), Retrofitted Vehicles	\$9,888.99	\$282,057.11	\$105,907.90	\$0.00	\$0.00	\$0.00

Combined Fleet Locomotive Engine Replacement Data

Annual	NOx (tons/year)	PM (tons/year)	HC (tons/year)	CO (tons/year)	CO2 (tons/year)	Diesel-Equivalent (gallons/year)
Baseline of Entire Fleet	68.776	1.4448	3.6914	11.8512	290.82	26,200.00
Baseline of Vehicles	68.776	1.4448	3.6914	11.8512	290.82	26,200.00
Retrofitted Percent Reduced (%)	31.30%	52.20%	54.40%	0.00%	0.00%	0.00%
Amount Reduced Per Year	21.5006	0.7538	2.0076	0	0	0
Daily	NOx (kg/day)	PM (kg/day)	HC (kg/day)	CO (kg/day)	CO2 (kg/day)	Fuel (gal/day)
Kilograms Reduced Per Day (kg/day)	53.4384	1.8736	4.9897	0	0	0
Lifetime	NOx (tons)	PM (tons)	HC (tons)	CO (tons)	CO2 (tons)	Diesel-Equivalent (gallons)
Baseline of Entire Fleet	2,230.80	46.8636	119.7322	384.4033	516.71	46,550.45
Baseline of Vehicles	2,230.80	46.8636	119.7322	384.4033	516.71	46,550.45
Retrofitted Percent Reduced (%)	31.30%	52.20%	54.40%	0.00%	0.00%	0.00%
Amount Reduced	697.3874	24.4506	65.1175	0	0	0
Amount Emitted After Retrofit, Retrofitted Vehicles	1,533.41	22.413	54.6147	384.4033	516.71	46,550.45
Amount Emitted After Retrofit, Entire Fleet	1,533.41	22.413	54.6147	384.4033	516.71	46,550.45
Capital Cost Effectiveness (\$/ton), Retrofitted Vehicles	\$4,394.97	\$125,354.95	\$47,068.76	\$0.00	\$0.00	\$0.00
Total Cost Effectiveness (\$/ton), Retrofitted Vehicles	\$4,394.97	\$125,354.95	\$47,068.76	\$0.00	\$0.00	\$0.00

