GREENHOUSE GAS ANALYSIS – WAL-MART EXPANSION AND LOWE'S HOME IMPROVEMENT STORE PROJECT

SALEM, MASSACHUSETTS

December 2009

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TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

List of Tables

List of Figures

EXECUTIVE SUMMARY

A greenhouse gas (GHG) emissions analysis was performed for the proposed Wal-Mart Expansion and Lowe's Home Improvement Store Project. Carbon dioxide (CO_2) emissions were quantified for: (1) the Base Case corresponding to the October 18, 2008 7th Edition of the MA Building Code that adopted the IECC 2006 with the 2007 Supplement, (2) the Preferred Alternative, which includes some energy saving design features, and (3) the Mitigation Alternative, which includes additional energy savings elements.

The Mitigation Alternative includes the Massachusetts Prototype for Lowe's Home Centers developed in consultation with MEPA in response to comments from DOER and DEP. The Prototype involves a list of Greenhouse Gas Commitments (Exhibit 1 that follows) made by Lowe's to MEPA in a June 19, 2009 letter from Mark C. Kalpin, Esq. of WilmerHale to MEPA Director Alicia Barton McDevitt. Mr. Kalpin's letter and its detailed comments about the GHG Commitments are included at the end of this report.

Lowe's commitment to photo-voltaic (PV) generation involves the proposed installation of a demonstration project at its Quincy store and ensuring that its other stores that are built in Massachusetts (including in Salem) in the future have solar-ready roofs. Issues of the appropriate size of a PV system, whether the economies of the PV are feasible for a typical Lowe's store, and how the PV system integrates with the roof design and its structural supports will be addressed through the Quincy PV demonstration project and subsequent data analysis.

This analysis uses the Tech Environmental Energy Model and replicates the output of the US EPA Energy STAR Target Finder using data and algorithms from the U.S. DOE Energy Information Administration (EIA) and the American Society of Heating, Refrigeration, and Air-Conditioning Engineers. The Mitigation Alternative reduces the Project's total direct and indirect stationary source energy-related emissions of CO_2 by 8.7% compared to the Base Case.

CO_2 emissions produced by Project motor vehicle trips were analyzed using the US EPA MOBILE6.2 Mobile Source Emission Factor Model. Mitigation measures for transportation emissions include a number of transportation demand management (TDM) strategies and roadway improvements for the Project. These measures will improve traffic operations, reduce Project generated vehicle trips, and reduce Project-related motor vehicle CO_2 emissions by 2%. Overall, mitigation measures in the Mitigation Alternative, as adopted by the Project Proponent, are expected to reduce the Project's total CO_2 emissions (stationary source plus transportation) by 8.4% compared to the Base Case.

EXHIBIT 1
Lowe's Home Center's, Inc.
Massachusetts Greenhouse Gas Commitments[1]

Massachusetts Prototype	Quincy Store
HVAC Duct Sealing and Insulation	<u>All Massachusetts Prototype Commitments</u>
High Reflective Cool Roof Design	<u>Implement the following Additional Commitments and Evaluate Each (over Time) for Potential Future Inclusion in the Massachusetts Prototype:</u>
Additional Roof Insulation	Solar PV Generation
Demand Control Ventilation	Building Management System Controls for Demand Response
Energy Sub-Metering to Monitor Consumption	Garden Center Water Monitoring System
Energy Management Program	Ultra Low Flow Toilets and Urinals
Building Management Systems	Third Party Building Commissioning
High-Efficiency HVAC System	<u>Additional Items if Financial Incentives Available</u>:
Office Space Motion Sensors	LEED Certification
Use of Day Lighting in Garden Center	Additional Wall Insulation
Third Party Energy Systems Verification	Day Lighting Control - Main Building
Partial Green Power Purchasing	Testing of Limited LED Lighting Applications
Energy Efficient Windows	
Construction Waste Management Program	
Operations Waste Management Program	
Water Conserving Fixtures	
Additional Roof Support for Potential Future PV System	
Modify Existing Roadway / Intersection Configurations to Increase Capacity and Reduce Delays	
Implement a Transportation Demand Management Program to Reduce Project Generated Vehicle Trips, and which includes the following: (a) Bike Storage Racks; (b) Staggered Employee Work Hours; (c) Posting of 'No-Idling" Signage for Delivery Vehicles; (d) Internet Shopping Alternative; and (e) Direct Deposit Banking for Full-Time Employees	
EPA SmartWay Transport Partnership Program	
Lowe's Energy Awareness Delivers Savings Program	
Sale of Energy Star Qualified Products	
Use of Smart Irrigation Systems	

[1] The implementation of each commitment listed above is (a) based on industry standards in effect as of the date of this summary, and (b) contingent on the receipt of all applicable federal, state and local permits and approvals.

PROJECT GREENHOUSE GAS (GHG) EMISSIONS ANALYSIS

Background

This report was prepared to satisfy the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA) "Greenhouse Gas Emissions Policy and Protocol" (February 3, 2009). The Policy requires a project to quantify carbon dioxide (CO_2) emissions and identify measures to avoid, minimize or mitigate such emissions. In addition, the Policy requires the Project Proponent to quantify the effect of proposed mitigation in terms of emissions reduction and energy savings. The GHG analysis contained herein conforms to the EOEEA Policy. The GHG Emissions Policy and Protocol only requires quantification of GHG emissions from three sources: direct emissions from on-site stationary sources, indirect emissions from energy generated off-site (electricity), and traffic generated by the project.

The Project's GHG emissions will include direct emissions of CO_2 from natural gas combustion for heating and cooking. Indirect emissions of CO_2 will result from Project-generated motor vehicle trips and from electricity used for lighting, refrigeration, building cooling and ventilation, and the operation of other equipment inside the Project buildings.

Building Energy and GHG Emissions Analysis

Energy modeling for the Project used the Tech Environmental Energy Model that replicates the output of the US EPA Energy STAR Target Finder, using data and algorithms from the U.S. Department of Energy (DOE) Energy Information Administration (EIA) and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). Energy use and CO_2 emissions are summarized in Table 1.

The Project will consist of the expansion of an existing Wal-Mart building to 152,192 square-feet; and the construction of a 121,859 square-foot Lowe's Home Improvement Store plus a 31,204 square-foot Garden Center that includes a 9,339 square-foot three-season room. The Base Case energy use calculates to be 8,742 MW-hours per year (MWhr/year) of electricity and 11,614 thousand cubic feet per year (Mcf/year) of natural gas. For the Preferred Alternative, these energy figures are reduced to 8,043 MWhr/year of electricity and 10,824 Mcf/year of gas. The Mitigation

Alternative discussed in Section 4, further reduces energy use to 7,964 MWhr/year of electricity and 10,824 Mcf/year of natural gas. Overall, the Mitigation Alternative is expected to reduce the Project's total CO_2 emissions from direct and indirect stationary source fuel use by 8.7%. CO_2 emissions for each project alternative are summarized in Table 1C.

There are tradeoffs for some of the proposed mitigation measures. The use of skylights reduces electricity usage by allowing more natural light into the store; thereby reducing the amount of lighting needed. However, skylights reduce the effective insulation of the roof, and thereby increase the wintertime heating load and natural gas usage for the building. Installing a high-albedo cool roof reduces the cooling electrical load in the summertime, but increases the heating load and natural gas usage in the wintertime.

TABLE 1A

ENERGY AND CO_2 MODELING FOR SALEM WALMART/LOWE'S PROJECT

***Walmart* - SUPERSTORE**

Walmart **SUPERSTORE**	Area (sf)	Electrical Usage (MWh/yr)	Electrical Reduction (%)	Gas Usage (Mcf/yr)	Gas Reduction (%)	Heating CO_2 Emissions (tons/yr)	Electrical CO_2 Emissions (tons/yr)	Total CO_2 Emissions (tons/yr)	CO_2 Emissions Reduction (%)
Base Case	152,192	5,824.5		7,306.8		440.6	3,727.6	4,168.3	
Energy Efficient HVAC (EER = 11.0)	152,192	5,807.6	0.3%	7,306.8	0.0%	440.6	3,716.9	4,157.6	0.3%
Super Energy Efficient HVAC (EER = 12.6)	152,192	5,751.0	1.3%	7,306.8	0.0%	440.6	3,680.6	4,121.3	1.1%
Daylight Harvesting (25% Lighting Reduction)	152,192	5,437.2	6.7%	8,120.4	-11.1%	489.7	3,479.8	3,969.4	4.8%
Energy Management System	152,192	5,785.9	0.7%	6,734.5	7.8%	406.1	3,703.0	4,109.1	1.4%
Refrigeration Waste Heat Recovery System	152,192	5,824.5	0.0%	7,138.7	2.3%	430.4	3,727.6	4,158.2	0.2%

TABLE 1B

ENERGY AND CO_2 MODELING FOR SALEM WALMART/LOWE'S PROJECT

***Lowe's* - HOME IMPROVEMENT STORE**

Lowe's **HOME IMPROVEMENT STORE**	Area (sf)	Electrical Usage (MWh/yr)	Electrical Reduction (%)	Gas Usage (Mcf/yr)	Gas Reduction (%)	Heating CO_2 Emissions (tons/yr)	Electrical CO_2 Emissions (tons/yr)	Total CO_2 Emissions (tons/yr)	CO_2 Emissions Reduction (%)
Base Case	121,859	2,917.3		4,306.7		259.7	1,867.1	2,126.8	
Increase Roof Insulation (R-value = 24)	121,859	2,870.3	1.6%	3,899.3	9.5%	235.2	1,837.0	2,072.1	2.6%
Energy Efficient HVAC (EER = 10.5)	121,859	2,906.4	0.4%	4,306.7	0.0%	259.7	1,860.1	2,119.7	0.3%
Super Energy Efficient HVAC (EER = 11.5)	121,859	2,873.8	1.5%	4,306.7	0.0%	259.7	1,839.2	2,098.9	1.3%
Cool Roof Design	121,859	2,860.8	1.9%	4,380.1	-1.7%	264.1	1,830.9	2,095.1	1.5%
Daylight Harvesting (~12% Light Reduction)	121,859	2,852.2	2.2%	4,306.7	0.0%	259.7	1,825.4	2,085.1	2.0%
Energy Management System	121,859	2,885.2	1.1%	3,881.3	9.9%	250.3	1,846.5	2,080.6	2.2%
Purchase 2% Green Power	121,859	2,858.9	2.0%	4,306.7	0.0%	259.7	1,829.7	2,089.4	1.8%

TABLE 1C

ENERGY AND CO_2 MODELING FOR SALEM WALMART/LOWE'S PROJECT

***Walmart & Lowe's* - TOTAL**

Walmart & Lowe's **TOTAL GHG EMISSIONS**	Area (sf)	Electrical Usage (MWh/yr)	Electrical Reduction (%)	Gas Usage (Mcf/yr)	Gas Reduction (%)	Heating CO_2 Emissions (tons/yr)	Electrical CO_2 Emissions (tons/yr)	Total CO_2 Emissions (tons/yr)	CO_2 Emissions Reduction (%)
Base Case	274,051	8,742		11,614		700	5,595	6,295	
Combined Efficiency Measures									
Preferred Alternative *Increase Roof Insulation (R = 24) (Lowe's)* *Energy Efficient HVAC (EER = 11/10.5)* *Cool Roof Design (Lowe's)* *Daylight Harvesting (12-25% Light Reduction)* *Energy Management System* *Refrigeration Waste Heat Recovery (Wal-Mart)* *Purchase 2% Green Power (Lowe's)*	274,051	8,043	8.0%	10,824	6.8%	652	5,150	5,802	7.8%
Mitigation Alternative *Increase Roof Insulation (R = 24) (Lowe's)* *Super Energy Efficient HVAC (EER = 12.6/11.5)* *Cool Roof Design (Lowe's)* *Daylight Harvesting (12-25% Light Reduction)* *Energy Management System* *Refrigeration Waste Heat Recovery (Wal-Mart)* *Purchase 2% Green Power (Lowe's)*	274,051	7,964	8.9%	10,824	6.8%	652	5,097	5,749	8.7%

TRANSPORTATION GHG EMISSIONS ANALYSIS

The proposed Project will consist of the expansion of an existing Wal-Mart store to a size of 152,192 square-feet, and the construction of a 121,859 square-foot Lowe's Home Improvement Store plus a 31,204 square-foot Garden Center that includes a 9,339 square-foot three-season room. The Project will be located off of Route 107 (Highland Avenue) in Salem. The Project would have direct access onto Route 107 (Highland Avenue) from two site driveways, one a signalized full access driveway and the second a right-in/right-out driveway.

Based on an unadjusted ITE basis, the Project is expected to generate 5,876 daily motor vehicle trips on a weekday and 7,658 daily motor vehicle trips on a Saturday. The 2014 No-Build and Build traffic volumes include a 1% annual growth in background traffic from 2008. The 2014 No-Build and Build traffic volumes also include traffic from five projects identified by the City of Salem. The average daily traffic volumes generated by the Project were reduced by 25% because a portion of the Project motor vehicle trips will be satisfied by vehicles that are already on the local roadways (pass-by trips). After the application of the reductions for pass-by and internal trips, the Project is expected to generate 4,407 new daily motor vehicle trips on a weekday and 5,744 new daily motor vehicle trips on a Saturday, and these adjusted traffic volumes were used for the GHG analysis. Please see the Transportation Study Report for more details on how the traffic volumes were calculated.

Transportation CO_2 emissions were calculated and the results are summarized in Table 2. To be conservative, the transportation GHG emissions analysis study area includes the entire traffic study area for the Project, and is defined by the following six roadway segments in Salem and Lynn (see Figure 1):

1) Route 107 – Fays Avenue to Meineke Driveway
2) Route 107 - Meineke Driveway to Existing South/Future Main Project Driveway
3) Route 107 - Existing South/Future Main Project Driveway to Existing Main Driveway
4) Route 107 - Existing Main Driveway to Existing/Future North Project Driveway
5) Route 107 - Existing/Future North Project Driveway to Olde Village Drive
6) Route 107 - Olde Village Drive to Ravenna Avenue/Barnes Road.

Transportation Analysis Procedure

The transportation portion of the GHG analysis calculated emissions of CO_2 over the project study area for three scenarios:

- 2014 No-Build
- 2014 Build
- 2014 Build with Mitigation.

The vehicle miles traveled (VMT) for each of the six roadway segments was calculated by multiplying the length of each road segment by the average daily traffic volume on the segment. Average daily (24-hour) traffic volumes (ADTs) were provided by traffic engineers at Greenman-Pedersen, Inc. Table 3 shows the VMT calculation spreadsheet.

The CO_2 emissions for each roadway segment were calculated by multiplying the daily VMT by the MOBILE6.2 predicted CO_2 emission factors in grams per mile. Table 4 shows the CO_2 emission calculation spreadsheet. The MOBILE6.2 model was run with MOBILE6.2 input files for 2014 provided by the MA DEP. The MOBILE6.2 predicted CO_2 emission factor for motor vehicles is 562.70 grams/mile for 2014, and is identical for all vehicle speeds.

Predicted Transportation Impacts

A summary of the results of the transportation GHG emissions analysis is presented in Table 2. The table shows that the emissions of CO_2 for the 2014 No-Build case are predicted to be 2,881.5 tons/year. The emissions of CO_2 for the 2014 Build case without mitigation are predicted to be 3,153.9 tons/year. The difference between the 2014 Build without mitigation and the 2014 No-Build CO_2 emissions, 274.2 tons/year, represents the CO_2 Build case emissions released by Project-generated trips, without any mitigation. The transportation mitigation measures reduce Project transportation CO_2 emissions by 2%, such that the Build with Mitigation emissions decline to 266.9 tons/year.

FIGURE 1

TRANSPORTATION STUDY AREA
WAL-MART EXPANSION AND LOWE'S HOME IMPROVEMENT STORE
SALEM, MASSACHUSETTS

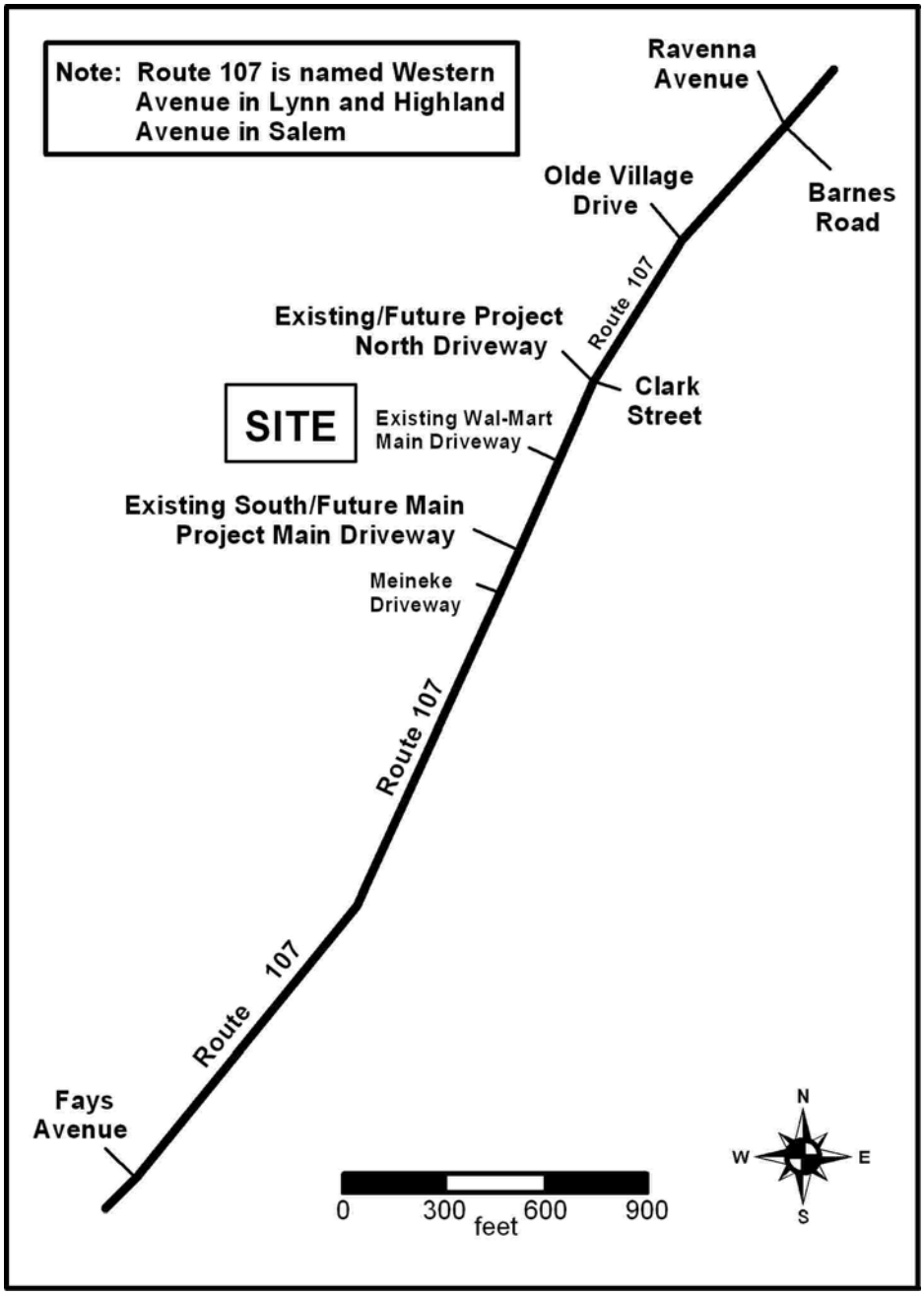

TABLE 2

MOTOR VEHICLE CO_2 EMISSIONS SUMMARY

Total Predicted CO_2 Emissions Burden		
2014 No-Build	2014 Build without Mitigation	2014 Build with Mitigation
7,168.2 kg/day	7,845.8 kg/day Project: 677.6 kg/day	7,832.3 kg/day Project: 664.1 kg/day
2,881.5 tons/yr	3,153.9 tons/year Project: 272.4 tons/year	3,148.4 tons/year Project: 266.9 tons/year

TABLE 3
Vehicle Miles Traveled (VMT) in the Mesoscale Study Area -
Wal-Mart Expansion and Lowe's Home Improvement Store Project, Salem, Massachusetts

		Average Daily Traffic (ADT) (vehicles/day)				Vehicle Miles Traveled (VMT) (miles/day)			
Link I.D.	Link Length (feet)	2008 Existing	2014 No-Build	2014 Build	2014 Build w/mitig.*	2008 Existing	2014 No-Build	2014 Build	2014 Build w/mitig.*
1	2,030	16,142	17,931	19,650	19,616	6,206	6,894	7,555	7,542
2	140	16,859	18,683	20,401	20,367	447	495	541	540
3	275	16,205	18,029	20,366	20,319	844	939	1,061	1,058
4	275	17,142	19,005	20,366	20,338	893	990	1,061	1,059
5	480	17,306	19,190	20,923	20,888	1,573	1,745	1,902	1,899
6	450	17,794	19,668	21,401	21,366	1,517	1,676	1,824	1,821
					VMT (miles/day):	11,480	12,739	13,943	13,919

*Mitigation assumes an 2% reduction in the total project-generated traffic due to the implementation of proposed Transporation Demand Management (TDM).

TABLE 4
Total Daily Motor Vehicle Carbon Dioxide (CO_2) Emissions
in the Mesoscale Study Area -
Wal-Mart Expansion and Lowe's Home Improvement Store Project, Salem, Massachusetts

		MOBILE6.2 CO_2 Emission Rate (gram/mile)		Vehicle Miles Traveled (VMT) (miles/day)				Mesoscale CO_2 Emissions (kg/day)			
Link I.D.	Speed (mph)	2008	2013	2008 Existing	2014 No-Build	2104 Build	2014 Build w/mitig.	2008 Existing	2014 No-Build	2014 Build	2014 Build w/mitig.
1	35	554.48	562.70	6,206	6,894	7,555	7,542	3,441.1	3,879.2	4,251.1	4,243.7
2	40	554.48	562.70	447	495	541	540	247.9	278.8	304.4	303.9
3	40	554.48	562.70	844	939	1,061	1,058	468.0	528.4	596.9	595.5
4	40	554.48	562.70	893	990	1,061	1,059	495.0	557.0	596.9	596.1
5	45	554.48	562.70	1,573	1,745	1,902	1,899	872.4	981.6	1,070.3	1,068.5
6	45	554.48	562.70	1,517	1,676	1,824	1,821	840.9	943.2	1,026.3	1,024.7
					Total Daily CO_2 Emissions (kg/day):			6,365.2	7,168.2	7,845.8	7,832.3

GREENHOUSE GAS (GHG) MITIGATION ANALYSIS

The GHG Policy requires that the Project Proponent to identify measures to avoid, minimize, or mitigate GHG emissions. The following sections discuss the measures the Proponents will implement for the Wal-Mart Expansion and Lowe's Home Improvement Store Project in Salem.

Siting and Site Design Mitigation Measures

All reasonable and feasible siting and site design mitigation measure will be adopted by the Project, see Table 5. The Project Proponent is committing to the following mitigation measures:

- ***Sustainable Development Principles*** – The Project would utilize a previously developed parcel of land, and would be designed to minimize the disruption to wetland buffer zones. The Project would provide a site for the new City of Salem water tower on high terrain west of the development.

- ***Protect Open Space on the Project Site*** – Approximately 20% of the site would remain as open space.

- ***Conserve and Restore Natural Areas On-Site*** – Most wetlands would be preserved and less than 5,000 s.f. of bordering vegetated wetlands on the site would be altered. The Project will include an extensive stormwater management system that will collect and treat runoff before it enters the local hydrological system.

- ***Minimize Building Footprint*** –The proposed project has been designed such that it is the smallest size project that is considered to be economically feasible for redevelopment of the site.

- ***Design Project to Support Alternative Transportation to the Site*** – MBTA bus service exists on Highland Avenue with a bus stop at the site. The Project design also includes bike racks for alternative transportation to the site.

- ***Design Water Efficient Landscaping*** –Water efficient landscaping will be installed to minimize water use. Drought-resistant and native plants will be used for landscaping. Existing native trees along the edges of the site will be maintained. Smart irrigation systems will be used to minimize unnecessary irrigation.

The following siting and site design mitigation measures were considered not to be technically feasible for the Project:

- ***Minimize Energy Use Through Building Orientation*** – Due to the size and the shape of the land parcel and constraints imposed by Route 107 and the existing parking field on the site, the buildings are oriented facing east toward Route 107 or north toward the internal driveway for the signalized intersection. It is not feasible to re-orient the buildings to the south.

- ***Low Impact Development (LID) for Stormwater Design*** – Due to the extensive rock ledge on the site, it is technically infeasible to implement LID design features. To the extent possible, the stormwater management system will utilize Best Management Practices (BMPs) to collect and treat runoff from impervious surfaces.

Building Design and Operation Mitigation Measures

All reasonable and feasible building design and operational mitigation measures will be adopted by the Project, see Table 6. These measures are listed below and the CO_2 reductions are documented in Table 1 and are discussed in the Mitigation Summary at the end of this section. Mitigation measures to reduce direct and indirect CO_2 emissions are presented together because measures to reduce electrical use for cooling in a building, such as a high-albedo roof and skylights, inadvertently require more fuel to be burned for space heating because heat from solar gain is reduced. Percentage reductions for individual energy efficiency measures listed in Table 1 do not simply sum to the net reduction because when several measures are combined, the reduction of the second measure is applied to a lower base level that includes the reducing effects of the first measure, and so forth.

Please note that while Wal-Mart and Lowe's utilize slightly different sets of energy efficiency measures from the overall menu of mitigation measures, they both achieve meaningful total energy reductions for the Mitigation Alternative.

BUILDING DESIGN ELEMENTS FOR THE PREFERRED ALTERNATIVE

The following mitigation measures will be included in the Project design and are assumed for the CO_2 emission calculations in Table 1.

- ***Energy Management Systems*** – Lowe's and Wal-Mart each utilize a highly efficient energy management system (EMS) to track and control energy use from their respective headquarters in North Carolina and Arkansas. EMS features include Demand Control Ventilation and Energy Sub-Metering to monitor consumption. Store functions and energy needs are closely monitored 24 hours per day, 7 days per week, and the use of heat, cooling, and lighting is minimized.

- ***Seal, Test and Insulate HVAC Supply Ducts*** – In both stores, HVAC supply ducts will be sealed, leak tested, and insulated to reduce energy losses.

- ***Install High-Efficiency HVAC Systems*** – Each store will have HVAC units ranging in size from 3 to 20 tons cooling capacity. The Base Case assumes the required Energy Efficiency Ratio (EER) values for these units (assuming installation after January 1, 2010) under the October 18, 2008 7th Edition of the MA Building Code, which equals a cooling capacity-weighted average of 10.2.[1] For the Preferred Alternative Lowe's would install HVAC units with an overall cooling capacity-weighted average of 10.5 (higher than Code). For the Preferred Alternative Wal-Mart would install HVAC units with an overall cooling capacity-weighted average of 11.0 (higher than Code).

- ***Energy Efficient Windows and Building Envelope*** -- The October 18, 2008 7th Edition of the MA Building Code has increased minimum building envelope and window insulation for new commercial buildings. Each store will use energy efficient windows, roof and wall insulation that comply with the updated MA Building Code. Lowe's will increase roof insulation to a higher-than-Code value of R-24.

- ***Install Energy Efficient Interior Lighting*** – Both stores use energy efficient T-8 lighting with electronic dimming ballasts and LED lights. Both stores' lighting plans will meet or exceed the power density limits (watts/square-foot) in the updated MA Building Code. Since detailed lighting plans and power density figures are not available at this stage in the project development, no energy reduction credit has been taken.

- ***Maximize Interior Day-Lighting (Skylights)*** – The Lowe's design uses skylights in the three-season room in the Garden Center. Lowe's has concluded that use of skylights elsewhere in the store is not feasible due to excessive heat loss through currently available skylights. Lowe's is working with a manufacturer to address its thermal requirements for a new skylight and will reevaluate and implement if proven to save energy and it is cost effective. The Wal-Mart design has one skylight per 1,000 sf of roof area in its new stores, with electronic dimming ballasts tied to computer-controlled daylight sensors. In both stores, daylight harvesting will reduce electrical use for lighting.

- ***Incorporate Motion Sensors in Lighting*** – The majority of the Project's building space will be for retail use and motion sensor activated lighting is not appropriate for this use. Motion sensor activated lighting will be used for administrative offices and restrooms within the two stores.

- ***Use Energy Efficient Exterior Lighting*** – The Project design includes energy efficient and directed exterior lighting in the parking areas. Pulse-start metal halide or sodium vapor lamps and ballasts will be used. Exterior lighting will be controlled with timers to reduce energy use. Exterior building signs will be LED illuminated.

[1] Code-required EERs for 5, 10, 15, and 20 ton HVAC units are 11.2, 11.2, 11.0 and 10,0, respectively. 2007 Supplement to the IECC, Table 503.2.3(1).

- ***Use Highly-Reflective, Cool Roofing Materials*** –Lowe's would install a highly reflective cool roof on their store. Wal-Mart's policy is to install a white roof membrane in climate zones south of New England, but for the climate zone corresponding to the Salem site Wal-Mart would use a black roof membrane because there are more heating days than cooling days in the year.

- ***Waste Heat Recovery*** – For the food market portion of Wal-Mart, waste heat from the refrigeration system would be used is used to produce hot water for use in the store. The net energy savings of this waste heat recovery design is estimated to be 155 Mcf of natural gas per year for Wal-Mart. Lowe's would not have food refrigeration systems.

- ***Energy STAR Appliances and Products*** – All computer and employee break-room refrigerators in the stores will be Energy STAR rated for high efficiency. Both stores sell Energy STAR products.

- ***Purchase Renewable Energy*** – Lowe's allocates 2% of green power purchasing credit to each store nationwide, including the proposed Salem store. Lowe's contracts with a third-party broker of Renewable Energy Certificates to accomplish the green power purchase. Wal-Mart is considering a similar green power purchasing program for the Salem store.

- ***Use Water Conserving Fixtures*** – Both stores would use metered faucets and bathroom fixtures that to conserve water and use less water than the minimum mandated by the Building Code. Toilets would use 1.28 gallons per flush, urinals would use 1.0 pints per flush (0.125 gallons/flush), and lavatories would use water at 0.5 gallons per minute.

- ***Provide for Storage and Collection of Recyclables in Building Design*** – The Project design provides for storage and collection of recyclables. Wal-Mart would recycle: cardboard, wooden pallets, plastics, office paper, retail electronics, used tires, used motor oil, and beverage containers. Lowe's would recycle: cardboard, wooden pallets, scrap metal, batteries, fluorescent bulbs and beverage containers. See EENF Sections 5.3.3 and 6.3.4 for more details.

- ***Conduct Building Commissioning to Ensure Energy Performance*** – Comprehensive building commissioning would be done by the energy audit teams in the respective Lowe's and Wal-Mart organizations. Both companies conduct a review of a new building's heating, cooling, ventilation, lighting, and energy management systems and verify they are operating according to their design specifications.

- ***Use Building Materials with Recycled Content, Building Materials that are Manufactured Within the Region, Use Rapidly Renewable Building Materials, and Use Low-VOC Building Materials*** – Whenever possible, the Project will use environmentally friendly building materials, including materials with recycled content, rapidly renewable building materials, and low-VOC materials. Also when practical, the Project will purchase building materials that are manufactured within the region. At this stage (concept building design), it is uncertain how much recycled content, locally produced materials, or rapidly renewable materials can be incorporated into the building design.

- ***Lowe's Energy Awareness Delivers Savings (LEADS) Program*** – Lowe's facility teams instruct employees how to reduce energy use in the store.

- ***Operations Waste Management Program*** –The stores would have waste disposal vendors that handle disposal of fluorescent bulbs and all packages that may be opened or damaged that contain hazardous materials, such as pool chemicals, garden supplies, sterno, etc. Both stores have recycling programs for other solid wastes (see above). The details of Lowe's Operations Waste Management Program are found on pages 2-4 of the attached letter from Mark C. Kalpin, Esq. of WilmerHale to MEPA Director Alicia Barton McDevitt.

- ***Demolition and Construction Materials Recycling*** – A portion of the existing Wal-Mart building would be demolished. Wal-Mart has a program to capture and recycle the metal, wood, floor and ceiling tiles, concrete, asphalt and other materials generated as part of Wal-Mart's demolition and construction process. Prior to the site demolition activities required at this location, Wal-Mart will contract with a waste management company to fully research all locations where construction activities will occur and provide a system specially designed to provide the widest possible range of materials recovery options for the new Salem store location, including the particular type of construction. The waste management company will work with each general contractor and Wal-Mart construction project manager to ensure full engagement. The goal of the Wal-Mart construction waste management plan will be to reuse/recycle at least 50% of the waste.

  There is no existing building on the Lowe's portion of the site requiring demolition. Lowe's will implement a concerted effort to identify the maximum amount of construction debris that can be reused and/or recycled during construction, and will impose this as a requirement on its construction contractor and sub-contractors. This approach reduces the costs associated with direct disposal, a common goal for both the Lowe's and the contractor, and reducing construction solid waste reduces energy use everywhere downstream.

ADDITIONAL DESIGN ELEMENTS FOR THE MITIGATION ALTERNATIVE

The Project will commit to the following additional design feature (Mitigation Alternative):

- ***Higher Efficiency HVAC Systems*** **-** For the Mitigation Alternative, Lowe's would install HVAC units with an overall cooling capacity-weighted average of 11.5. For the Mitigation Alternative Wal-Mart would install HVAC units with an overall cooling capacity-weighted average of 12.6.

Other building design and operation mitigation measures were considered for the Project, but were rejected for various reasons. The following mitigation measures were considered to be either technically/financially infeasible or inappropriate for the Project:

- ***Reduce Energy Demand by Using Peak Shaving or Load Shifting Strategies*** – These energy measures are not appropriate for retail stores, which must use power during peak periods to serve customers.

- ***Incorporate Combined Heat and Power (CHP) Technologies into Project*** – CHP requires a host for the constant and substantial steam load (waste heat) generated as part of the process. Lowe's and Wal-Mart's thermal loads are insufficient to make CHP economically feasible.

- ***Construct Green Roof*** -- The Proponents do not consider it economically feasible to construct and maintain a green roof for either of the Project buildings. Green roofs, which consist of layers of gravel, soil and vegetation atop a rubberized water-proof membrane, are expensive to install and maintain. They typically require a steel-reinforced concrete roof that can support a dead weight of 35 lb/sf and the installation cost exclusive of roof redesign is $30/sf.[2] While green roof technology has the potential to improve stormwater management on the Project and reduce overall energy costs, the significant additional costs ($2 to $3 million for each retail building) related to the required engineering, construction and installation of the green roof is not economically feasible.

- ***On-Site Renewable Energy*** – Lowe's commitment to photo-voltaic (PV) generation involves a demonstration project for the Quincy store and making sure other stores that are built in Massachusetts in the future have solar-ready roofs (see the letter from Mark C. Kalpin, Esq. of WilmerHale to MEPA Director Alicia Barton McDevitt at the end of this report). Issues of the appropriate size of a PV system, whether the economies of the PV are feasible for a typical Lowe's store, and how the PV system integrates with the roof design and its structural supports will be addressed through the Quincy PV demonstration project and subsequent data analysis.

  The following text provides an alternative analysis for a photovoltaic (PV) installation on either Lowe's or Wal-Mart under two options: 1) Retail store ownership of the system, or a 2) Third-Party Solar Provider. The EOEEA Large Scale Retail Task Force/Economics Solar Subcommittee concluded (November 8, 2009) that in the majority of cases, large retailers are likely to prefer a third-party ownership model.

  A PV system, and the building roof to which it is attached, must be designed to safely support any combination of loads, including the dead weight of the PV array and aerodynamic wind loading. Due to the fact the upward tilt of PV arrays create an airfoil on a roof, wind loading is often the strongest force acting on a building roof with a PV system.[3] For a roof-mounted PV system with an ideal 30^{o} tilt, the wind load would be 35-40 psf. Since the roof structure for the Project buildings are not adequate to support that wind load, it is assumed a PV system would be flat-mounted on the roof, with 5 lb/sf of roof ballast to hold it down.

  For the alternative analysis, two solar PV system sizes were examined: 200 kW and 120 kW. A 200 kW system is generally considered the minimum size for a financially feasible third-party vendor PPA.[4] The EOEEA Large Scale Retail Task Force/Economics Solar Subcommittee concluded (November 8, 2009) that third-party solar providers tend to view larger installations (e.g. over 250 kW) as a more attractive business opportunity than smaller installation, and the current Commonwealth Solar rebate structure (which has since been discontinued) therefore does not provide the most favorable economics at a scale that would be most effective at

[2] Oberndorfer, Erica, et al., "Green Roofs as Urban Ecosystems: Ecological Structures, Functions and Services," BioScience, Vol. 57, No. 10, November 2007.
[3] Messenger, R. and Ventre, J, Photovoltaic Systems Engineering, CRC Press, 2004.
[4] Personal communication, Dave Hebert, Gloria Spire Solar, March 3, 2009.

attracting third-party providers to seek contracts with large retailers in Massachusetts. The Subcommittee also concluded that the economics for rebates is favorable for solar systems in the 100-120 kW range. In Massachusetts, a 200 kW PV system, flat-mounted, is projected to generate approximately 206,528 kWh per year,[5] which equates to 132 tons per year[6] in GHG emissions reductions. A 200 kW PV system would reduce the annual Mitigation Alternative CO_2 emissions (Table 8) by approximately 2.2% (= 100% * 132/ 6,101). A 120 kW PV system would reduce annual CO2 emissions by 1.3%.

The estimated installed cost of the system is $7.63[7] per rated Watt, which gives a cost of $1,526,000 for the 200-kW system and $915,600 for the 120-kW system. The economics of a PV installation were calculated using the Commercial Solar (CS) Financial Model 2009, as requested by DOER[8] and a copy of the model is provided in the Appendix. The cost calculator inputs are as follows:

- PV system size of 200 kW or 120 kW
- System cost of $7.63/Watt[6]
- Annual capacity factor of 11.8% (flush mounted on roof)[4]
- MA-manufactured components = yes
- Public building adder = no
- An inverter replacement frequency of once every 10 years[3]
- Customer discount rate of 8%

The default customer discount rate in the CS Financial Model is 3%, which is incorrect. The customer discount rate is defined as the interest rate of return that could be earned in an investment in the financial markets with similar risk. At present, a 20-year U.S. Treasury bond pays over 4%; that is the lowest risk investment possible and is not comparable to the risk of investing in a PV system. Corporate bond rates are 6% to 10%, depending on their investment grade. The MTC Calculator, which was applied in this type of analysis previously, uses a customer discount rate of 8%. That rate is reasonable and is used in these PV cost calculations. The calculations assume all current financial incentives: federal tax credits and all available State MTC rebates including the MA-manufactured components credit.

For the 200-kW system, the calculated Net Present Value of the PV system is -$106,818, the Internal Rate of Return (IRR) is 4.2%, and the Simple Payback assuming 100% cash payment for the system is 14 years. For the 120-kW system, the calculated Net Present Value of the PV system is -$39,813, the Internal Rate of Return (IRR) is 5.5%, and the Simple Payback assuming 100% cash payment for the system is eight years. Based on market research, almost 90 percent of strong prospects would consider a payback of four years, but acceptance begins to drop rapidly once paybacks reach five years.[9] The Simple Payback also has serious limitations as a

[5] Personal communication, Natalie Howlett, Renewable Energy Project Coordinator, Massachusetts DOER, December 18, 2008. This figure is 4 times 51,632 kWh/year for a 50 kW system.
[6] Annual PV system electrical generation is 206.5 MWh. Multiplying by the DOE/EIA emission factor of 1,280 lb CO_2 per MWh and dividing by 2,000 lb/ton yields an annual CO_2 emission reduction of 132 tons/year.
[7] Personal communication, Natalie Howlett, Renewable Energy Project Coordinator, Massachusetts DOER, December 11, 2008.
[8] http://masstech.org/renewableenergy/commonwealth_solar/threebiz2009.html
[9] *Assessment of California CHP Market and Policy Options for Increased Penetration*, Final Report, Cosponsors Public Interest Energy Research Program (PIER) and California Energy Commission, July 2005.

measure of cost feasibility and is not used in making business decisions because it ignores inflation, the time value of money and investment risk. Net Present Value (NPV) is the standard financial method for using the time value of money to appraise long-term projects. Used for capital budgeting, and widely throughout economics, NPV measures the excess or shortfall of cash flows, in present value terms, once financing charges are met. If the NPV is positive, an investment may be accepted since it would add value to a project over the long-term. If the NPV is negative, as is the case in this instance, the investment should be rejected. The IRR is the annualized effective compound return rate that can be earned on the invested capital, i.e. the yield on the investment. A project is a good investment if its IRR is greater than the rate of return that could be earned by alternate investments of equal risk; in this case the alternate rate of return is the 8% discount rate in the financial model. A PV system does not have positive financials for this Project, due to the projected negative Net Present Value of the PV system, even with all available State MTC rebates and federal tax credits. Option 1 is not financially feasible for Lowe's or Wal-Mart.[10]

Option 2, installation and ownership by a third-party provider, would have similar financials to those presented above. While installed cost would likely be less on a $/W basis due to discount arrangements, a third-party provider would need to recover his own labor costs and profit, along with the PV installation cost through the Power Purchase Agreement (PPA) payments for electricity from the host (Lowe's or Wal-Mart). While initial electricity costs would not increase over standard utility rates for the retail stores, there is a possibility of higher electric rates for the stores in later years when the PPA escalates power costs to cover the PV system installation and operating costs.

To allow for Option 2, Lowe's and Wal-Mart would each designate space on their building roof as "solar ready" with sufficient support to accommodate flat-mounted PV system (static weight not to exceed 5 psf) for a possible third-party provider PV installation in the future. When the economics become favorable, Lowe's and Wal-Mart each would examine the economic feasibility of a PPA with a third party provider.

[10] On October 23, 2009, the Massachusetts Renewable Energy Trust announced that the Commonwealth Solar Program had been closed to all future applications for commercial projects. Although Massachusetts has announced its intention to replace the CommSolar Program with a Solar Renewable Energy Certificate ("S-REC") carve-out program, the details of that program are still being developed. The financial modeling presented in this GHG Report assumes that the CommSolar Program will remain in effect; in light of the recent discontinuance of that program by the Trust, the installation of a solar PV system in connection with the currently proposed project would be even more economically infeasible.

Transportation Mitigation Measures

The Project Proponents are committing to a number of Transportation Demand Management (TDM) strategies to reduce employee and customer vehicle trips (see Table 7). The TDM measures are designed to help reduce peak hour and daily vehicle trips through the temporal spreading of the peak hour demand, increased vehicle occupancy rates, and shifting the mode of transportation from single occupancy vehicles. Any single company that employs more than 250 applicable commuting employees[11] is subject to Massachusetts DEP's Ridesharing Regulation 310 CMR 7.16 (Reduction of Single Occupant Commuter Vehicle Use). Neither Wal-Mart nor Lowe's will have 250 applicable commuting employees and thus the Ridesharing Regulation does not apply to the Project. Nevertheless, the TDM strategies presented above are consistent with the measures that would be expected to achieve the level of reduction in commuter vehicle use required by DEP's Ridesharing Regulation.

The proposed transportation mitigation measures are listed below and in aggregate it is conservatively estimated they would reduce CO_2 transportation emissions by 2%. The on-site food service would reduce all trips (employees and customers) by 1%, and the remaining TDMs would reduce employee trips by up to 16%. Whereas employee trips are approximately 5% of total trips, the net effect of the other TDMs is another 1% reduction in total trips. Thus, the benefit of the TDM measures is estimated to be 2% of all transportation emissions.

- ***Develop Multi-Use Paths To and Through Site*** – The Project would provide sidewalks, marked crosswalks, pedestrian traffic signals, lighting, and landscaping, to encourage pedestrian travel between the stores within the Project and across Highland Avenue to other stores.

- ***Size Parking Capacity to Meet, Not Exceed, Local Parking Requirements*** – The Project's parking capacity is sized to be the minimum amount to meet typical retail parking requirements and is not excessive.

- ***Develop a Parking Management Program to Minimize Parking Requirements*** – The Project's parking design minimizes the parking requirements. Preferential parking spaces will be provided to people who rideshare.

[11] Applicable commuting employees refers to store employees that work at least 17 hours per week, for 20 or more weeks per year, and are scheduled to begin and complete their workday between 6 a.m. and 8 p.m.

- ***Provide On-Site Food Service*** – Wal-Mart will provide on-site food service for employees and customers of both Lowe's and Wal-Mart.

- ***Provide Bicycle Storage*** – The Project Proponents will provide secure bicycle storage racks near each store.

- ***Appoint an Employee Transportation Coordinator (ETC) and Distribute Ridesharing/Transit Information*** – An ETC will be appointed by the Proponents to distribute MBTA bus schedules and information about the ride-matching program.

- ***Roadway and Signalization Improvements to Improve Traffic Flow*** – The Proponents have proposed roadway and traffic signal improvements. See the EENF Section 5.4 for details.

- ***Internet Shopping*** – The Proponents will promote use of Lowe's and Wal-Mart's internet sites as a shopping alternative and provide incentives for customers who do not drive to the store, e.g. reduced delivery cost of merchandise.

- ***Preferential Parking*** – The Proponents will off preferential parking spaces for vanpools, carpools, and/or advanced technology vehicles.

- ***Form a Transportation Management Association*** (TMA) - There currently is no TMA that supports the Project area. The Proponents will investigate the feasibility of creating a local TMA with nearby commercial properties in the area.

- ***Offer Alternative Work Schedules*** – The Proponents would provide staggered work shifts to reduce peak period traffic volumes.

- ***Rideshare Program*** – The Proponents will institute a ride-matching program. The program will be coordinated with MassRides. This organization provides a commuter hotline, a vanpool program, and a computerized ride-match service.

- ***Direct Deposit for Employees*** – The Proponents would offer direct deposit of paychecks for fulltime employees.

- ***EPA SmartWay Program*** – The Proponents participate in the EPA SmartWay Transport Partnership. SmartWay is a voluntary program that increases energy efficiency and reduces greenhouse gas emissions.

- ***No-Idling Truck Zones*** – Signs will be posted at both stores to provide no-idling truck zones at loading/off-loading areas.

- ***Guaranteed Ride Home*** -- The Proponents would offer an emergency ride home program to those employees who regularly commute by bus or vanpool to the site and who have to leave work in the event of a family emergency or leave work late due to unscheduled overtime.

- ***Locate New Buildings Near Transit***– The Project is located on Highland Avenue, which has MBTA bus service.

Additional transportation mitigation measures were also considered for the Project, but were rejected for various reasons. The following mitigation measures were considered to be either not technically/financially unfeasible or inappropriate for the Project:

- ***Purchase Alternative Fuel and/or Fuel Efficient Vehicles for Fleet*** - The Proponents will not maintain a fleet of vehicles. This measure is inapplicable.

- ***Pursue Opportunities to Minimize Parking Supply Through Shared Parking*** – It is not feasible to share parking with other commercial establishments in Salem given their location relative to the project site.

Mitigation Summary

Table 8 summarizes the CO_2 emissions for the proposed retail project, for the Base Case (a building that complies with MA Building Code), the Preferred Alternative (includes some energy mitigation measures), and the Mitigation Alternative (includes additional energy savings). The Project will commit to the Mitigation Alternative for which total CO_2 emissions are reduced 8.4% from 6,567 tons/year to 6,016 tons/year, a 551 ton/year reduction in CO_2 emissions from the Base Case.

TABLE 5

PROJECT SITING AND SITE DESIGN MITIGATION MEASURES
WAL-MART EXPANSION AND LOWE'S HOME IMPROVEMENT STORE PROJECT, SALEM

Suggested Mitigation Measure	Part of Project Design	Technically/ Economically Infeasible	Inappropriate to Project Type
Sustainable Development Principles	✓		
Protect open space on the Project site	✓		
Conserve and restore natural areas on-site	✓		
Minimize building footprint	✓		
Design Project to support alternative transportation to site	✓		
Use low impact development (LID) for stormwater design		✓	
Design water efficient landscaping	✓		
Minimize energy use through building orientation		✓	

TABLE 6

BUILDING DESIGN AND OPERATION MITIGATION MEASURES
WAL-MART EXPANSION AND LOWE'S HOME IMPROVEMENT STORE PROJECT, SALEM

Suggested Mitigation Measure	Part of Project Design	Technically/ Economically Infeasible	Inappropriate to Project Type
Construct green roofs			✓
Use high-albedo (high-reflection) cool roofing materials	✓		
Install energy efficient interior lighting	✓		
Install high-efficiency HVAC systems	✓		
Reduce energy demand by using peak shaving or load shifting strategies			✓
Maximize interior day-lighting	✓		
Energy efficient windows and building envelope	✓		
Incorporate motion sensors in lighting	✓		
Energy Management System and track energy use and performance	✓		
Seal HVAC supply ducts	✓		
Use energy efficient exterior lighting	✓		
Incorporate combined heat and power (CHP) technologies into project			✓
Use water conserving fixtures	✓		
Energy STAR appliances	✓		
Refrigeration system waste heat recovery	✓		
Provide for storage and collection of recyclables in building design	✓		

TABLE 6 (continued)

BUILDING DESIGN AND OPERATION MITIGATION MEASURES
WAL-MART EXPANSION AND LOWE'S HOME IMPROVEMENT STORE PROJECT, SALEM

Suggested Mitigation Measure	Part of Project Design	Technically/ Economically Infeasible	Inappropriate to Project Type
Use building materials with recycled content, manufactured within region, rapidly renewable, and low-VOC.	✓		
Conduct building commissioning to ensure energy performance	✓		
Demolition and construction materials recycling	✓		
Operations waste management program	✓		
On-site renewable energy		✓	
Purchase renewable energy	✓		

TABLE 7

TRANSPORTATION DEMAND MITIGATION MEASURES
WAL-MART EXPANSION AND LOWE'S HOME IMPROVEMENT STORE PROJECT, SALEM

Suggested Mitigation Measure	Part of Project Design	Technically/ Economically Infeasible	Inappropriate to Project Type
Locate new buildings near transit	✓		
Purchase alternative fuel and/or fuel efficient vehicles for fleet			✓
Join or form a Transportation Management Association	✓		
Develop multi-use paths to and through site	✓		
Size parking capacity to meet, but not exceed, local parking requirements	✓		
Pursue opportunities to minimize parking supply through shared parking			✓
Develop a parking management program to minimize parking requirements	✓		
Reduce employee trips during peak periods through alternative work schedules	✓		
Provide a guaranteed ride home program	✓		
Provide on-site food service	✓		
Provide bicycle storage	✓		

TABLE 7 (continued)

TRANSPORTATION DEMAND MITIGATION MEASURES
WAL-MART EXPANSION AND LOWE'S HOME IMPROVEMENT STORE PROJECT, SALEM

Suggested Mitigation Measure	Part of Project Design	Technically/ Economically Infeasible	Inappropriate to Project Type
Appoint an Employee Transportation Coordinator (ETC) who will distribute ridesharing/transit information	✓		
Roadway and traffic signal improvements to improve traffic flow	✓		
Internet Shopping	✓		
Rideshare Program	✓		
Direct Deposit for employee paychecks	✓		

TABLE 8

GREENHOUSE GAS (CO_2) EMISSIONS SUMMARY
WAL-MART EXPANSION AND LOWE'S HOME IMPROVEMENT STORE PROJECT, SALEM
(TONS/YEAR)

Source	Base Case	Preferred Alternative	Percent Reduction in GHG Emissions	Mitigation Alternative	Percent Reduction in GHG Emissions
Direct Emissions	700	652	6.8%	652	6.8%
Indirect Emissions	5,595	5,150	8.0%	5,097	8.9%
Subtotal Direct and Indirect Emissions	6,295	5,802	7.8%	5,749	8.7%
Transportation Emissions	272.4	266.9	2.0%	266.9	2.0%
Total CO_2 Emissions	6,567	6,069	7.6%	6,016	8.4%

June 19, 2009

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By E-mail and First Class Mail

Alicia Barton McDevitt
Assistant Secretary and MEPA Director
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: Lowe's Home Centers, Inc.
Massachusetts Greenhouse Gas Commitments

Dear Ms. McDevitt:

On March 3, 2009, Lowe's Home Center's, Inc. ("Lowe's") transmitted its proposed Massachusetts Greenhouse Gas Commitments (the "Commitments") to the Massachusetts Environmental Policy Act ("MEPA") Office for review and comment. Lowe's has informed the MEPA Office that Lowe's will formally propose to implement the Commitments in connection with one of the next store proposals that will be submitted by Lowe's for review under MEPA. As we have discussed, that store location likely will be in Salem, Massachusetts. A copy of the Commitments, which are included as Exhibit 1, have been revised to reflect the issues that are discussed in Exhibit 2.

As part of the Commitments, Lowe's proposes to seek a Certification from the Secretary under MEPA that future Lowe's stores constructed in Massachusetts for a specified period of time would not be required to quantify and model Greenhouse Gas ("GHG") emissions associated with energy consumption (stationary source direct and indirect emissions) if constructed in accordance with the Commitments. The GHG emissions associated with the site specific aspects of future store proposals, such as the specific store location and associated traffic generation, would still be reviewed on a site-by-site basis.

On April 7, 2009, the MEPA Office provided detailed comments on the Commitments to Lowe's. In those comments, the MEPA Office proposed that the approval for the Commitments that was contained in a Certificate issued by the Secretary would be limited to those stores that commenced review under MEPA on or before January 1, 2012. This date is acceptable to Lowe's.

In its comments, the MEPA Office (on behalf of itself, the Massachusetts Department of Environmental Protection, and the Massachusetts Department of Energy Resources) stated that a number of the specific measures that were included in the Commitments were acceptable. Lowe's appreciates this approval. The MEPA Office also requested additional information on

several of the measures that would be implemented. The response of Lowe's to this request for additional information is included as Exhibit 2.

As we have discussed, Lowe's voluntarily has agreed to implement the Commitments at its proposed store in Quincy (a store which already has completed the MEPA review process). As part of this proposal, Lowe's proposes to implement additional GHG reduction and energy efficiency measures on a trial basis, including the installation of an approximate 110 kw solar (PV) generation facility.

Lowe's looks forward to continuing to work cooperatively with the MEPA Office and the Commonwealth of Massachusetts to implement the Commitments at both the Quincy Store and future Lowe's stores in the Commonwealth. Please do not hesitate to contact me if you have questions or need additional information.

Sincerely,

Mark C. Kalpin

Attachments

cc: Lindsay C. McGrady
Charles A. Martin
Robert B. Jess
Larry LePere

EXHIBIT 1
Lowe's Home Center's, Inc.
Massachusetts Greenhouse Gas Commitments[1]

Massachusetts Prototype	Quincy Store
HVAC Duct Sealing and Insulation	<u>All Massachusetts Prototype Commitments</u>
High Reflective Cool Roof Design	<u>Implement the following Additional Commitments and Evaluate Each (over Time) for Potential Future Inclusion in the Massachusetts Prototype:</u>
Additional Roof Insulation	Solar PV Generation
Demand Control Ventilation	Building Management System Controls for Demand Response
Energy Sub-Metering to Monitor Consumption	Garden Center Water Monitoring System
Energy Management Program	Ultra Low Flow Toilets and Urinals
Building Management Systems	Third Party Building Commissioning
High-Efficiency HVAC System	<u>Additional Items if Financial Incentives Available</u>:
Office Space Motion Sensors	LEED Certification
Use of Day Lighting in Garden Center	Additional Wall Insulation
Third Party Energy Systems Verification	Day Lighting Control - Main Building
Partial Green Power Purchasing	Testing of Limited LED Lighting Applications
Energy Efficient Windows	
Construction Waste Management Program	
Operations Waste Management Program	
Water Conserving Fixtures	
Additional Roof Support for Potential Future PV System	
Modify Existing Roadway / Intersection Configurations to Increase Capacity and Reduce Delays	
Implement a Transportation Demand Management Program to Reduce Project Generated Vehicle Trips, and which includes the following: (a) Bike Storage Racks; (b) Staggered Employee Work Hours; (c) Posting of 'No-Idling" Signage for Delivery Vehicles; (d) Internet Shopping Alternative; and (e) Direct Deposit Banking for Full-Time Employees	
EPA SmartWay Transport Partnership Program	
Lowe's Energy Awareness Delivers Savings Program	
Sale of Energy Star Qualified Products	
Use of Smart Irrigation Systems	

[1] The implementation of each commitment listed above is (a) based on industry standards in effect as of the date of this summary, and (b) contingent on the receipt of all applicable federal, state and local permits and approvals.

EXHIBIT 2
Response To The Request Of The
Massachusetts MEPA Office for Additional Information on the
Greenhouse Gas Commitments Proposed by Lowe's Home Centers, Inc.

1. Construction Waste Management Program and Operations Waste Management Program - what *is the targeted diversion rate associated with these programs?*

Lowe's does not have a specific target volume for waste diversion, but instead has developed a comprehensive program as outlined below.

Waste Management

Construction Term

Lowe's will implement a concerted effort to identify the maximum amount of construction debris that can be reused and/or recycled during construction, and will impose this as a requirement on its construction contractor and sub-contractors. This approach greatly reduces the costs associated with direct disposal, a common goal for both the Lowe's and the contractor.

Operation Term Waste Management

Lowe's Social Responsibility

Projects proposed by Lowe's integrate numerous sustainable design components that serve to avoid or minimize potential environmental impacts.

ENERGY STAR®: Lowe's earned honors from the EPA and the Department of Energy's ENERGY STAR® award for the sixth year in a row (2003-2008).

SmartWay Transport Partner: In October 2008, Lowe's earned its second Environmental Excellence Award from the U.S. EPA SmartWay℠ Transport Partnership. Lowe's was recognized for their leadership in conserving energy and lowering greenhouse gas emissions through effective use of transportation and freight delivery system. To earn the award, Lowe's implemented initiatives that resulted in reduced carbon dioxide emissions and less overall highway congestion. These included increasing shipping by rail; instituting a more efficient process for inbound and outbound freight deliveries; increasing efficiency of truckload shipments allowing more products to be shipped on a fewer trailers, and continuing to use a higher percentage of SmartWay carriers.

Lowe's maintains a recycling program at each store. Recycled items include rechargeable batteries, scrap metal, cardboard, and wooden pallets. In 2007, Lowe's recycled the following items.

- 140,000 tons of cardboard
- 76 tons of shrink wrap at distribution centers

- 141 tons of scrap metal
- 233,000 fluorescent bulbs
- 8 million wood pallets

In an effort to reduce waste, Lowe's shipping and packaging materials such as shrink wrap are removed at the distribution centers, which reduce the amount of packaging materials delivered to each store. The majority of goods are either packed in cardboard or stacked on wooden pallets. The cardboard is baled at each store and picked up for recycling by a vendor. The pallets are stored in a trailer and picked up for recycling (and in most cases are resold) by a vendor. In addition to cardboard and pallets, Lowe's maintains a Rechargeable Battery Program, in which 85% of its stores participate. The batteries are collected from customers and stored inside the store in boxes. The batteries are picked up by a vendor and recycled. Those items which are not recyclable are stored in metal hopper bins, compacted and transferred to waste containers for pick up and off site disposals by a waste hauler.

Returned products slated for recycling, including white goods, are stored in the rear of the building in a fenced in area, or stored in a trailer located along the rear of the building. The trailer contents are picked up by a vendor who removes and recycles the merchandise as scrap metal.

According to the MassDEP, items restricted for disposal, transfer for disposal and contracting for disposal of certain hazardous and recyclable items at solid waste facilities in Massachusetts include the following.

- Recyclable Paper: All paper, cardboard, and paperboard products (except tissue paper, toweling, paper plates and cups, wax-coated cardboard and other low-grade paper products). All cardboard and paperboard products are baled, stored and removed by an outside vendor for recycling.
- Glass Containers: Glass bottles and jars. The ban does not cover light bulbs, Pyrex cookware, plate glass, drinking glasses, windows, windshields and ceramics. This is not applicable to the operation of a Lowe's store.
- Metal Containers: Aluminum, steel or bi-metal beverage and food containers. Recycling bins are provided in the break areas of each store; however the actual recycling of aluminum cans is at the discretion of store employees.
- Single Resin Narrow-Necked Plastics: A soda bottle is narrow-necked but a yogurt container is not. The recycling of plastics is at the discretion of store employees.
- Leaves & Yard Waste: Leaves, grass clippings, weeds, garden materials, shrub trimmings, and brush one-inch or less in diameter (excluding diseased plants). Each Lowe's site is maintained by a landscape company and all waste associated with landscape care is removed from the site by the landscape contractor.
- Batteries: Lead-acid batteries used in motor vehicles or stationary applications. This is not applicable to Lowe's operations, however Lowe's does have a Rechargeable Battery Recycling Program which began in 2004 and has collected more than 207,000 pounds of rechargeable batteries from customers. The

equipment requiring batteries including forklifts are serviced by an outside vendor and items such as batteries, tires, fluids, etc are serviced and disposed of off site by the vendor.

- White Goods: Appliances employing electricity, oil, natural gas or liquefied petroleum gas. These include refrigerators, freezers, dishwashers, clothes washers, clothes dryers, gas or electric ovens and ranges, and hot water heaters. Lowe's offers to dispose of used appliances free of charge for customers purchasing new products. White good items targeted for removal from the store are stored in trailers at the rear of the building, picked up and recycled by an outside vendor.
- Whole Tires: Motor vehicle tires of all types (Incinerators and transfer stations can accept whole tires. Shredded tires are not restricted). Not applicable to Lowe's operations.
- Cathode Ray Tubes: Any intact, broken or processed glass tube used to provide the visual display in televisions, computer monitors and certain scientific instruments. Not applicable to Lowe's operations.

Generally, hazardous waste including cleaning products, pesticides, paints, solvents etc. is often the result of a spill during the shipping process or during stocking or customer purchasing. Absorbent pads used for spill cleanup which are available in spill kits located within the store. Some of the items, including cleaning products are used in the general maintenance of the store. Those that cannot be used on site are bagged, tagged, logged and inventoried, then transferred to a tray or shelf within a caged area at the rear of the store. The caged area is enclosed by an overhead structure to prevent mixing with stormwater runoff. In addition, a barrel is placed beneath the shelf as secondary containment in case of a leak. The materials are then removed for disposal by an outside vendor. All Lowe's employees are trained in spill prevention and clean-up.

Each Lowe's store maintains an inventory of pallet recycling and a percentage weight of cardboard recycling and provides an efficiency report to corporate on an annual basis. The inventory is part of the much larger company wide recycling effort with an emphasis on increasing the nationwide recycling effort. Further information regarding these initiatives can be found at www.lowes.com/socialresponsibility.

2. **Additional Roof Insulation** – ***need to identify R values for both current Code and proposed level of insulation.***

Lowe's will increase the amount of its roof insulation to a minimum 4" thickness, resulting in an approximate R value of 24.

3. **Partial Green Power Purchasing** – ***need to clarify how this program works. Previous filings indicated that Lowe's would purchase green power to cover 2% of each store's energy demand.***

Lowe's contracts with a third party broker of certified Renewable Energy Certificates (RECS or Green Power). Lowe's currently is under contract through 2010 to purchase enough Green

Power to maintain its position as an EPA Green Power Partner. Lowe's intends to maintain this position. Lowe's currently is on the EPA's list of the top ten retailers that purchase Green Power, and also is on the list of the top 20 Fortune 500 Companies that purchase Green Power.

4. **Energy Efficient Windows** – ***Lowe's will provide additional information on type of windows and how it compares to Code requirements.***

- Windows – Seasonal Display Area – Approx. 312 s.f.
- Double Pane Windows – PPG SolarCool – Low E – R-2.25 or U-0.44
- The proposed windows exceed Code requirement of R-1.08 or U-0.92 by more than a factor of *two*.

5. **Demand Control Ventilation** – ***need to provide more information regarding this proposed measure and how it would specifically work to reduce heating and cooling requirements.***

DCV uses CO_2 sensors to determine the amount of outdoor air required. Otherwise, Lowe's would be required to operate continuously at the minimum required outdoor air that is established by Tables in the Indoor Air Quality standard ASHRAE 62.1. The DCV system allows the store to operate with the outdoor air dampers closed, and the system will only open the dampers when the sensors indicate high levels of CO_2. This maintains acceptable indoor air quality and saves energy.

6. **Energy Sub-Metering to Monitor Consumption** – ***need to provide additional information regarding implementation of this concept.***

The energy sub-metering system provides feedback information and allows Lowe's to monitor the load profile of the building. This gives Lowe's an opportunity to control the loads in the building, which optimizes energy consumption by reducing peak electricity usage and reducing overall energy demand.

7. **Building Management Systems Energy Management Program** – ***It is unclear how these two measures are distinct and how each would operate. Please provide additional information.***

The BMS system provides the graphical interface and inputs to control equipment and tells the equipment when to run. When combined with information gathered from sub-metering this provides an extremely effective energy management system.

8. **Third Party Energy Systems Verification** – ***need to provide additional information on what specific type of systems verification is proposed.***

This verification confirms that all lights, HVAC, and plumbing fixtures are operating at the design conditions, and are being controlled properly by the BMS system.

9. Please evaluate the following additional measures for inclusion in the Prototype store

a. **High-Efficiency HVAC System** – ***need to provide additional information on the specific type and efficiency of HVAC system proposed by Lowe's. In addition, DOER comments indicate that a more efficient option would be centrifugal chiller with water cooled condenser. This type of air conditioner is approximately 2 times as efficient as the rooftop units.***

Lowe's respectfully disagrees that a centrifugal chiller with water cooled condenser is more than twice as efficient as a rooftop unit. This could only be true under ideal circumstances that are not typical of field results. Lowe's is constantly looking into more efficient cooling and heating systems. Chillers are not feasible for Lowe's and are more practical for operators that have grocery (coolers and freezers). Long-term maintenance is also a concern. Lowe's works closely with HVAC manufacturers to relay our energy needs and to secure more efficient products at affordable prices. Lowe's currently uses High Efficiency rooftop units (including one of the most efficient commercial units available, which is rated at 11.5 EER).

b. **Water Conserving Fixtures** – ***need to provide more information on the type of fixtures and whether they exceed current Code. Agencies also suggested Lowe's should consider ultra low flow toilets and urinals for the prototype as well as the Quincy store.***

Lowe's installs 1.6 gpm toilets, 1.0 gpm urinals, and 0.5 gpm manually metered faucets. Lowe's does not use infrared controlled fixtures due to numerous maintenance issues. Lowe's will use dual flush toilets and ultra-low flush urinals (1-pint per flush).

Proposed Fixtures include the following.

- Water Closets – 1.28 GPF (HE Fixture)
- Urinal – 1.0 PPF (pint per flush) (HE Fixture)
- Lavatory – Self Metered 0.5 GPM (lever is actuated by occupant and delivers water for approx. 5 seconds)

c. **Implement a Transportation Demand Management Program to Reduce Project Generated Vehicle Trips, and which includes the following: (a) Bike Storage Racks; (b) Staggered Employee Work Hours; (c) Internet Shopping Alternative; and (d) Direct Deposit Banking for Full-Time Employees**— ***Agency comments: The TDM measures could be strengthened consistent with other Lowe's projects to include appointment of an employee transportation coordinator (ETC), provision of transit information, ride-matching and on-site amenities. In addition, MassDEP has provided a comprehensive list of TDM measures that they should consider incorporating into the prototype and/or the Quincy store. (See Attachment A). As noted above, the site-specific traffic generation aspects of a project and corresponding traffic demand management (both of which are addressed through MassHighway permitting) would still***

need to be reviewed for each individual project. Attachment A provides a list of certain measures that the agencies would like Lowe's to commit to including in all Massachusetts Prototype store proposals, as well as site-specific mitigation measures they would like to see Lowe's consider in the future

Lowe's has modified Attachment A to reflect the TDM measures to which it will commit.

d. Identify a lighting power level (watts/sf) for interior lighting that exceeds Code and identify a lighting power level for exterior signage and parking.

Lowe's will meet the requirements for Lighting Power Density given in ASHRAE Standard 90.1-2007. Code requirements are a function of square feet and Lowe's will meet or exceed the Code.

e. Optimize building orientation for renewables consistent with measure to make buildings solar ready.

When evaluating site layouts to meet essential operational, access and visibility requirements for a given location, as directed by Lowe's Real Estate Committee, preference will be given to a building orientation that meets the above needs and maximizes the opportunity to implement renewables.

f. Consider use of increased day-lighting throughout the store.

At this time Lowe's has concluded the use of increased day-lighting throughout the store is not feasible due to the lacking thermal properties of skylights. Lowe's tests to date indicate Lowe's will lose more heat than is saved by lights using currently available skylights. Lowe's is working with a manufacturer to address its thermal requirements for a new skylight and will re-evaluate and implement if proven to save energy and is cost effective.

g. Consider inclusion of rainwater harvesting for all stores.

Due to unknown site constraints and jurisdictional requirements for future projects, Lowe's can not agree to rainwater harvesting on every project in Massachusetts. Rainwater harvesting will be considered on individual project basis in conjunction with water conserving fixtures. Lowe's currently utilizes Smart Irrigation systems that monitor rainfall at the store location to minimize un-necessary watering.

10. Proposed Quincy Store Commitments

The Quincy Store will implement all of the Massachusetts Prototype Commitments, and has proposed the inclusion of additional commitments. The agencies recommended that each additional measure that is implemented in Quincy should be evaluated over time for potential inclusion in the Massachusetts Prototype. The agencies strongly supported the proposal for the Quincy store, but requested additional information on the following measures.

a. **Additional Wall Insulation** – ***need to identify R-values compared to existing Code.***

Lowe's evaluation has concluded that additional wall insulation has no significant energy use reduction benefit and that available products are impractical or unfeasible. However Lowe's is willing to include continuous wall insulation if sufficient incentives are made available by the Commonwealth to offset the additional cost. Lowe's wall systems (insulated 12" CMU or insulated precast panels) provide a minimum R value of 4 to 7 as an evaluated wall mass assembly, which meets or exceeds the Code requirement.

b. **Additional Green Power Purchasing** – ***need to provide more information regarding the target level***

Lowe's will purchase green power to cover 2% of each store's energy demand.

c. **Building Management System Controls for Demand Response**—***provide additional information.***

This was discussed above for energy sub-metering and BMS systems. Again, when these two systems are combined Lowe's can successfully monitor and control events that affect the peak demand and also allows Lowe's to determine loads available for demand response.

d. **Solar PV Generation** – ***identify size of system and associated CO2 reductions and/or present as a percentage of overall building energy use.***

Lowe's will install a 110 kW system, which will generate approximately 120,000 kilowatt-hours of electricity on an annual basis and offset approximately 5% of the electricity use of the store.

e. **Ultra Low Flow Toilets and Urinals** – ***need to provide more information on the type of fixtures and whether they exceed current Code.***

Lowe's does not have particular flush rates at this time, but will install fixtures that meet or exceed the requirements in the current Code.

f. **LEED Certification** - ***LEED for New Construction requires the project to achieve at least 14% lower energy use than ASHRAE 90.1 2004 and provides points for up to 42% reductions from ASHRAE. The agencies encourage Lowe's to identify a target for LEED Certification (i.e. Basic, Silver or Platinum) and target level of points associated with energy efficiency and conservation.***

The new ASHRAE requirements include continuous wall insulation to qualify as a LEED certified project. Continuous wall insulation has not been proposed for Quincy. However Lowe's is willing to include continuous wall insulation if sufficient incentives are made available by the Commonwealth to offset the additional cost.

g. **Day Lighting Control - Main Building** – ***need to provide more information on this proposal to reduce energy use associated with lighting. Depending on available incentives from utilities, inclusion of this measure in the prototype may be warranted.***

This only is feasible if a more thermally efficient skylight is developed. Lowe's will continue to evaluate this issue in connection with the local utility company.

h. **Testing of Limited LED Lighting Applications** – ***Benefits of LED could be quite large and agencies strongly support implementation of this measure.***

Lowe's is heavily involved in LED testing, and should be in better position to develop a LED design by mid-summer 2009. This will be limited to some outdoor lighting, office lighting, and some in-rack product lighting. As the development of cost-effective LEDs continues, Lowe's hopes to see future implementation on the sales floor, but no practical solution exists at this time other than the limited areas offered above. Lowe's commits to use of LED lighting in the offices.

11. Recommendations for additional measures at the Quincy store

a. **Evaluate feasibility of CHP. Under the existing Mass. Alternate Power Portfolio Standard, there is a formula for Renewable Energy Credits determined by CHP fuel savings. Per this formula, a 200kW CHP unit with a electricity conversion efficiency of 33% and useful heat conversion efficiency of 33%, would receive a maximum payment of $5.12 per operating hour ($30,727.00 @ 6000 operating hours per year). Mass. Utilities will establish an incentive program for CHP installations by May 1 of this year. Funding is underway for the Northeast Institute for Combined Heat and Power (UMASS Amherst) for help with feasibility studies.**

Lowe's thermal load is insufficient to make CHP economically feasible.

b. **Evaluate feasibility of ground source heat pumps.**

The installation and maintenance of over 25,000 linear feet of piping would be required to provide ground source heating to the Quincy Store. This amount is not economically feasible or practical, in large part due to existing soil contamination on Site and the increased soil management costs that would be incurred.

c. **Reduce plug loads by using high efficiency appliances and office machines.**

In store printers are Energy Star rated and toners are remanufactured to eliminate waste disposal. Computer monitors are energy efficient LCD models. Any IT components replaced or upgraded goes to a product reseller to minimize disposal.

ATTACHMENT A
TDM MEASURES FOR LOWE'S PROJECTS

SITE SELECTION AND DESIGN/CONSTRUCTION

- When evaluating store siting requirements to meet essential operational, access and visibility requirements for a given market, as directed by Lowe's Real Estate Committee, preference will be given to locations in or adjacent to transit-oriented development (TOD) areas.
    - ½ from subway/rail station, ¼ mile from bus stop.
- Provide traffic signalization at site driveway to support pedestrian and bicycle safety.
- Make on and off site improvements to create a ped/bike friendly site including; sidewalks, paths, traffic signals, lighting and landscaping.
- Develop/support multi-use paths to project site (and through site unless single store development).
- Constrain parking capacity to meet, but not exceed, local parking requirements when deemed feasible by Lowe's based on projected store sales volume and, where deemed feasible by Lowe's, seek reductions in parking supply through special permits or waivers; provided, however, that if appealed, Lowe's may in withdraw parking reduction request.

OPERATIONS

- Provide Direct Deposit for employees.
- Provide staggered work hours for employees.
- Provide adequate bicycle storage.
- Participate in EPA SmartWay program.
- Provide no-idling truck zones at loading/off-loading and queuing areas. Signs will be posted.
- *Provide incentives for customers who don't drive to the store, i.e. reduced cost for home delivery of store merchandise.* Lowe's provides internet shopping for those who do not or can commute to a store location. Lowe's also has pickup truck rentals available at very low daily rates for customers.
- Provide Alternative Transportation Education (info on carpooling, transit maps, contacts).

PARKING PREFERENCES

- *Offer preferential parking spaces for carpools, vanpools, and/or advanced technology vehicles for 5% of parking capacity.*

PROMOTE PUBLIC TRANSIT USE TRANSIT

- Negotiate with transit providers on the potential to increase/facilitate public transit access to the site.
- Build bus shelters, benches, and lighting.
- Work with neighboring employers to identify interest in forming a shuttle link to nearby transit or other commercial area attractions.
- *Explore and if economically feasible join an area TMA.*

INFORMATION

- Publicize new/expanded service to employees and clients/customers (on-line newsletters, promotions, brochures, etc.).
- In-store TDM coordinator.

Commonwealth Commercial Solar Photovoltaic Calculator (posted 4/06/09)
Commonwealth Solar Rebate Program 2008 Version 3.0

Commercial: Commonwealth Solar Rebate Matrix ($/watt dc)				
Incremental Capacity	**1 to 25 kW** (1,000 to 25,000 watts)	**> 25 to 100 kW**	**> 100 kW to 200 kW**	**> 200 kW to 500 kW**
Base Incentive ($/watt dc)	$3.15	$3.00	$2.00	$1.40
PLUS: Additions to Base				
MA-Manufactured Components	$0.15	$0.15	$0.15	$0.15
Public Building Adder	$1.00	$1.00	$1.00	$1.00

Commercial: Commonwealth Solar Rebate Calculator	
Total PV Project Size (watts dc)	**120,000**
Total PV Project Size for Rebate Calculation (500 kW cap)	**120,000**
MA-manufactured components	yes
Public Building Adder	no
Rebate ($)	**$361,750.00**
Rebate ($/watt dc) based on total project size	**$ 3.01458**
Key	
Entry Cells	
Calculation Cells (not for Entry)	

Click here for Financial Model

On October 23, 2009, the Massachusetts Renewable Energy Trust announced that the Commonwealth Solar Program had been closed to all future applications for commercial projects. Although Massachusetts has announced its intention to replace the CommSolar Program with a Solar Renewable Energy Certificate ("S-REC") carve-out program, the details of that program are still being developed. The financial modeling presented in this GHG Report assumes that the CommSolar Program will remain in effect; in light of the recent discontinuance of that program by the Trust, the installation of a solar PV system in connection with the currently proposed project would be even more economically infeasible.

Commercial Solar Photovoltaic Project Simple Financial Model (posted 4/06/09)

Commonwealth Solar Rebate Program 2008 Version 3.0

DATA ENTRY AND FINANCIAL SUMMARY

Key

Entry Cells	
Cells Draw Data from Another Worksheet	
Calculation Cells (Not for Entry)	

Select Taxable or Non-Taxable Entity: Taxable

Project and Customer Cost Assumptions

Solar Photovoltaic System Size	120,000	Watts (DC STC)
Total System Cost/Watt	$ 7.630	$/Watt (DC STC)
Total System Cost	$ 915,600.00	

MTC Rebate Assumptions

Rebate$ per/Watt	$ 3.015	$/Watt (DC STC)
Total Rebate	$ 361,750	

Project Performance and Savings/ Cost Assumptions

Annual Net Capacity Factor	11.8%	kW (DC STC) to kWh AC
Annual Production Degradation	0.50%	%
Project Life	25	Years
Depreciation Life	20	Years
Electricity Revenue (Avoided Costs)	$ 0.15	$/kWh
Electricity Revenue (Avoided Costs) Annual Adjustor	3.0%	%
Renewable Energy Certificate (REC) Revenue	$ 0.00	$/kWh
REC Revenue Annual Adjustor	0.0%	%
REC Revenue Term	4	Years (must be equal to or less than project life)
Annual Operations and Maintenance Cost Factor	$ 17.59	$/kW/Year
Annual Operations and Maintenance Cost	$ 2,111	$/Year
Annual Operations and Maintenance Adjustor	3.0%	%
Future Inverter Replacement Cost	$ 0.75	$/Watt (DC STC)
Inverter Life, Replace Every X Years	10	Year (must be equal to or less than project life)

Tax Assumptions

Federal Tax Rate	35%	
State Tax Rate	10%	
Effective Tax Rate	42%	
Federal Tax Credit	30%	
State Tax Deduction	100%	
5 Year Accelerated Depreciation Schedule (MACRS)	20.00%	32.00% 19.20% 11.52% 11.52% 5.76%
Depreciation	20.00%	32.00% 19.20% 11.52% 11.52% 5.76% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00% 0.00%
Asset Basis		
Gross Cost	$ 915,600	
Rebate	$ -	
Less 50% of Federal Tax Credit	$ (137,340)	
Asset Basis	$ 778,260	

Financing Assumptions

% Financed w/ Cash	100%	
% Financed w/ Loan	0%	
Loan Interest Rate	9.00%	
Loan Period	20	Years (must be equal to or less than project life)
Net Cost	$ 553,850	
Loan	$ -	
Customer Discount Rate	8.00%	

Solar Project Financial Analysis Summary	
Net Present Value	$ (39,813)
Simple Payback (100% Cash only)	Year 8
Estimated Return on Equity	5.5%

PRO FORMA AND PRODUCTION

Project Output	Start-Up 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25
Annual Generation (kWh)		124,042	123,421	122,804	122,190	121,579	120,971	120,367	119,765	119,166	118,570	117,977	117,387	116,800	116,216	115,635	115,057	114,482	113,909	113,340	112,773	112,209	111,648	111,090	110,535	109,982

FINANCIAL SCHEDULES

INCOME STATEMENT

	Start-Up 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25
Electricity Revenue (Avoided Cost)		$ 18,606	$ 19,069	$ 19,542	$ 20,028	$ 20,526	$ 21,036	$ 21,559	$ 22,094	$ 22,643	$ 23,206	$ 23,783	$ 24,374	$ 24,979	$ 25,600	$ 26,236	$ 26,888	$ 27,556	$ 28,241	$ 28,943	$ 29,662	$ 30,399	$ 31,155	$ 31,929	$ 32,722	$ 33,536
MTC Rebate	$ 361,750																									
REC Revenue		$ 4,962	$ 4,937	$ 4,912	$ 4,888	$ 4,863	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Revenue (Avoided Costs)	$ 361,750	$ 23,568	$ 24,005	$ 24,455	$ 24,916	$ 25,389	$ 21,036	$ 21,559	$ 22,094	$ 22,643	$ 23,206	$ 23,783	$ 24,374	$ 24,979	$ 25,600	$ 26,236	$ 26,888	$ 27,556	$ 28,241	$ 28,943	$ 29,662	$ 30,399	$ 31,155	$ 31,929	$ 32,722	$ 33,536
Replace Inverter?	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No
Operations & Maintenance Costs		$ (2,111)	$ (2,174)	$ (2,239)	$ (2,307)	$ (2,376)	$ (2,447)	$ (2,520)	$ (2,596)	$ (2,674)	$ (2,754)	$ (2,837)	$ (2,922)	$ (3,009)	$ (3,100)	$ (3,193)	$ (3,289)	$ (3,387)	$ (3,489)	$ (3,593)	$ (3,701)	$ (3,812)	$ (3,927)	$ (4,045)	$ (4,166)	$ (4,291)
Inverter Replacement Cost		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (90,000)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (90,000)	$ -	$ -	$ -	$ -	$ -
Total Operating Expenses	$ -	$ (2,111)	$ (2,174)	$ (2,239)	$ (2,307)	$ (2,376)	$ (2,447)	$ (2,520)	$ (2,596)	$ (2,674)	$ (92,754)	$ (2,837)	$ (2,922)	$ (3,009)	$ (3,100)	$ (3,193)	$ (3,289)	$ (3,387)	$ (3,489)	$ (3,593)	$ (93,701)	$ (3,812)	$ (3,927)	$ (4,045)	$ (4,166)	$ (4,291)
EBITDA	$ 361,750	$ 21,457	$ 21,831	$ 22,215	$ 22,609	$ 23,013	$ 18,589	$ 19,038	$ 19,498	$ 19,969	$ (69,548)	$ 20,946	$ 21,452	$ 21,970	$ 22,500	$ 23,044	$ 23,600	$ 24,169	$ 24,752	$ 25,350	$ (64,039)	$ 26,587	$ 27,228	$ 27,884	$ 28,557	$ 29,245
Federal Depreciation Expense		$ (155,652)	$ (249,043)	$ (149,426)	$ (89,656)	$ (89,656)	$ (44,828)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
EBIT	$ 361,750	$ (134,195)	$ (227,212)	$ (127,211)	$ (67,046)	$ (66,642)	$ (26,239)	$ 19,038	$ 19,498	$ 19,969	$ (69,548)	$ 20,946	$ 21,452	$ 21,970	$ 22,500	$ 23,044	$ 23,600	$ 24,169	$ 24,752	$ 25,350	$ (64,039)	$ 26,587	$ 27,228	$ 27,884	$ 28,557	$ 29,245
Interest Expense		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
EBT	$ 361,750	$ (134,195)	$ (227,212)	$ (127,211)	$ (67,046)	$ (66,642)	$ (26,239)	$ 19,038	$ 19,498	$ 19,969	$ (69,548)	$ 20,946	$ 21,452	$ 21,970	$ 22,500	$ 23,044	$ 23,600	$ 24,169	$ 24,752	$ 25,350	$ (64,039)	$ 26,587	$ 27,228	$ 27,884	$ 28,557	$ 29,245
Federal taxes saved/(paid)	$ (113,951)	$ 47,719	$ 80,288	$ 45,301	$ 24,258	$ 24,130	$ 9,834	$ (5,997)	$ (6,142)	$ (6,290)	$ 24,342	$ (6,598)	$ (6,757)	$ (6,921)	$ (7,088)	$ (7,259)	$ (7,434)	$ (7,613)	$ (7,797)	$ (7,985)	$ 22,414	$ (8,375)	$ (8,577)	$ (8,784)	$ (8,995)	$ (9,212)
State taxes saved/(paid) [can not deduct federal depreciation expense]	$ (36,175)	$ (2,146)	$ (2,183)	$ (2,222)	$ (2,261)	$ (2,301)	$ (1,859)	$ (1,904)	$ (1,950)	$ (1,997)	$ 6,955	$ (2,095)	$ (2,145)	$ (2,197)	$ (2,250)	$ (2,304)	$ (2,360)	$ (2,417)	$ (2,475)	$ (2,535)	$ 6,404	$ (2,659)	$ (2,723)	$ (2,788)	$ (2,856)	$ (2,924)
Net Income	**$ 211,624**	**$ (88,621)**	**$ (149,107)**	**$ (84,131)**	**$ (45,050)**	**$ (44,813)**	**$ (18,264)**	**$ 11,137**	**$ 11,407**	**$ 11,682**	**$ (38,251)**	**$ 12,253**	**$ 12,549**	**$ 12,852**	**$ 13,163**	**$ 13,480**	**$ 13,806**	**$ 14,139**	**$ 14,480**	**$ 14,829**	**$ (35,221)**	**$ 15,553**	**$ 15,928**	**$ 16,312**	**$ 16,706**	**$ 17,108**

CASH FLOW STATEMENT

Cash From Operations

Net Income	$ 211,624	$ (88,621)	$ (149,107)	$ (84,131)	$ (45,050)	$ (44,813)	$ (18,264)	$ 11,137	$ 11,407	$ 11,682	$ (38,251)	$ 12,253	$ 12,549	$ 12,852	$ 13,163	$ 13,480	$ 13,806	$ 14,139	$ 14,480	$ 14,829	$ (35,221)	$ 15,553	$ 15,928	$ 16,312	$ 16,706	$ 17,108
Federal Depreciation Expense	$ -	$ 155,652	$ 249,043	$ 149,426	$ 89,656	$ 89,656	$ 44,828	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cash Flow From Operations	$ 211,624	$ 67,031	$ 99,936	$ 65,295	$ 44,606	$ 44,842	$ 26,564	$ 11,137	$ 11,407	$ 11,682	$ (38,251)	$ 12,253	$ 12,549	$ 12,852	$ 13,163	$ 13,480	$ 13,806	$ 14,139	$ 14,480	$ 14,829	$ (35,221)	$ 15,553	$ 15,928	$ 16,312	$ 16,706	$ 17,108

Cash From Investing

Installed PV Cost	$ (915,600)																									
One Time State Solar Investment Tax Deduction (Actual Cash Value)	$ 64,092																									
One Time Federal Solar Investment Tax Credit	$ 274,680																									
Cash Flow From Investing	$ (576,828)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Cash From Financing

Loan Disbursement	$ -																									
Loan Repayment (Principle)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cash Flow From Financing	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Annual Cash Flow	**$ (365,204)**	**$ 67,031**	**$ 99,936**	**$ 65,295**	**$ 44,606**	**$ 44,842**	**$ 26,564**	**$ 11,137**	**$ 11,407**	**$ 11,682**	**$ (38,251)**	**$ 12,253**	**$ 12,549**	**$ 12,852**	**$ 13,163**	**$ 13,480**	**$ 13,806**	**$ 14,139**	**$ 14,480**	**$ 14,829**	**$ (35,221)**	**$ 15,553**	**$ 15,928**	**$ 16,312**	**$ 16,706**	**$ 17,108**
Cumulative Cash Flow	**$ (365,204)**	**$ (298,174)**	**$ (198,237)**	**$ (132,942)**	**$ (88,336)**	**$ (43,494)**	**$ (16,930)**	**$ (5,793)**	**$ 5,614**	**$ 17,296**	**$ (20,955)**	**$ (8,702)**	**$ 3,847**	**$ 16,700**	**$ 29,862**	**$ 43,343**	**$ 57,149**	**$ 71,288**	**$ 85,768**	**$ 100,597**	**$ 65,376**	**$ 80,929**	**$ 96,858**	**$ 113,170**	**$ 129,876**	**$ 146,984**
Simple Payback	$	$ 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
Net Investment	$ (365,204)	$ (298,174)	$ (198,237)	$ (132,942)	$ (88,336)	$ (43,494)	$ (16,930)	$ (5,793)	$ 5,614	$ 17,296	$ (20,955)	$ (8,702)	$ 3,847	$ 16,700	$ 29,862	$ 43,343	$ 57,149	$ 71,288	$ 85,768	$ 100,597	$ 65,376	$ 80,929	$ 96,858	$ 113,170	$ 129,876	$ 146,984
Simple Payback Year	**8**								8				12													

DEBT SCHEDULES

Scenario A Loan: Debt Schedule	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25
Beginning Balance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Debt Service	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Principle	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Interest	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Ending Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

Disclaimer: This Unofficial Cash Flow Model is intended to provide non-residential entities that are considering the purchase and installation of solar energy equipment with a general understanding of possible financial implications of such purchase and installation. Those entities interested in learning more about the financial implications of the purchase and installation of solar energy equipment are urged to consult their own tax and financial experts. The information contained in the Unofficial Cash Flow Model may not be relied on by anyone for any purposes. Furthermore, the information contained in this model does not necessarily reflect the views of the Massachusetts Technology Collaborative or the Commonwealth of Massachusetts, and reference to any specific method does not constitute an implied or expressed recommendation or endorsement of it. Neither the Massachusetts Technology Collaborative nor the Commonwealth of Massachusetts make any warranties or representations, expressed or implied, as to the usefulness, completeness, or accuracy of any processes, methods or other information contained, described, disclosed, or referred to in this model.

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Commonwealth Commercial Solar Photovoltaic Calculator (posted 4/06/09)
Commonwealth Solar Rebate Program 2008 Version 3.0

Commercial: Commonwealth Solar Rebate Matrix ($/watt dc)				
Incremental Capacity	**1 to 25 kW** (1,000 to 25,000 watts)	**> 25 to 100 kW**	**> 100 kW to 200 kW**	**> 200 kW to 500 kW**
Base Incentive ($/watt dc)	$3.15	$3.00	$2.00	$1.40
PLUS: Additions to Base				
MA-Manufactured Components	$0.15	$0.15	$0.15	$0.15
Public Building Adder	$1.00	$1.00	$1.00	$1.00

Commercial: Commonwealth Solar Rebate Calculator	
Total PV Project Size (watts dc)	**200,000**
Total PV Project Size for Rebate Calculation (500 kW cap)	**200,000**
MA-manufactured components	yes
Public Building Adder	no
Rebate ($)	**$533,750.00**
Rebate ($/watt dc) based on total project size	**$ 2.66875**
Key	
Entry Cells	
Calculation Cells (not for Entry)	

Click here for Financial Model

On October 23, 2009, the Massachusetts Renewable Energy Trust announced that the Commonwealth Solar Program had been closed to all future applications for commercial projects. Although Massachusetts has announced its intention to replace the CommSolar Program with a Solar Renewable Energy Certificate ("S-REC") carve-out program, the details of that program are still being developed. The financial modeling presented in this GHG Report assumes that the CommSolar Program will remain in effect; in light of the recent discontinuance of that program by the Trust, the installation of a solar PV system in connection with the currently proposed project would be even more economically infeasible.

Commercial Solar Photovoltaic Project Simple Financial Model (posted 4/06/09)

Commonwealth Solar Rebate Program 2008 Version 3.0

DATA ENTRY AND FINANCIAL SUMMARY

Key

Entry Cells	
Cells Draw Data from Another Worksheet	
Calculation Cells (Not for Entry)	

Select Taxable or Non-Taxable Entity: Taxable

Project and Customer Cost Assumptions

Solar Photovoltaic System Size	200,000	Watts (DC STC)
Total System Cost/Watt	$ 7.630	$/Watt (DC STC)
Total System Cost	$ 1,526,000.00	

MTC Rebate Assumptions

Rebate$ per/Watt	$ 2.669	$/Watt (DC STC)
Total Rebate	$ 533,750	

Project Performance and Savings/ Cost Assumptions

Annual Net Capacity Factor	11.8%	kW (DC STC) to kWh AC
Annual Production Degradation	0.50%	%
Project Life	25	Years
Depreciation Life	20	Years
Electricity Revenue (Avoided Costs)	$ 0.15	$/kWh
Electricity Revenue (Avoided Costs) Annual Adjustor	3.0%	%
Renewable Energy Certificate (REC) Revenue	$ 0.00	$/kWh
REC Revenue Annual Adjustor	0.0%	%
REC Revenue Term	4	Years (must be equal to or less than project life)
Annual Operations and Maintenance Cost Factor	$ 17.59	$/kW/Year
Annual Operations and Maintenance Cost	$ 3,518	$/Year
Annual Operations and Maintenance Adjustor	3.0%	%
Future Inverter Replacement Cost	$ 0.75	$/Watt (DC STC)
Inverter Life, Replace Every X Years	10	Year (must be equal to or less than project life)

Tax Assumptions

Federal Tax Rate	35%																							
State Tax Rate	10%																							
Effective Tax Rate	42%																							
Federal Tax Credit	30%																							
State Tax Deduction	100%																							
5 Year Accelerated Depreciation Schedule (MACRS)	20.00%	32.00%	19.20%	11.52%	11.52%	5.76%																		
Depreciation	20.00%	32.00%	19.20%	11.52%	11.52%	5.76%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Asset Basis	
Gross Cost	$ 1,526,000
Rebate	$ -
Less 50% of Federal Tax Credit	$ (228,900)
	-
Asset Basis	$ 1,297,100

Financing Assumptions

% Financed w/ Cash	100%	
% Financed w/ Loan	0%	
Loan Interest Rate	9.00%	
Loan Period	20	Years (must be equal to or less than project life)
Net Cost	$ 992,250	
Loan	$ -	
Customer Discount Rate	8.00%	

Solar Project Financial Analysis Summary	
Net Present Value	$ (106,818)
Simple Payback (100% Cash only)	Year 14
Estimated Return on Equity	4.2%

PRO FORMA AND PRODUCTION

Project Output	Start-Up 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25
Annual Generation (kWh)		206,736	205,702	204,674	203,650	202,632	201,619	200,611	199,608	198,610	197,617	196,629	195,646	194,667	193,694	192,726	191,762	190,803	189,849	188,900	187,955	187,016	186,080	185,150	184,224	183,303

FINANCIAL SCHEDULES

INCOME STATEMENT

	Start-Up 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25
Electricity Revenue (Avoided Cost)		$ 31,010	$ 31,781	$ 32,571	$ 33,380	$ 34,210	$ 35,060	$ 35,931	$ 36,824	$ 37,739	$ 38,677	$ 39,638	$ 40,623	$ 41,632	$ 42,667	$ 43,727	$ 44,814	$ 45,927	$ 47,069	$ 48,238	$ 49,437	$ 50,666	$ 51,925	$ 53,215	$ 54,537	$ 55,893
MTC Rebate	$ 533,750																									
REC Revenue		$ 8,269	$ 8,228	$ 8,187	$ 8,146	$ 8,105	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Revenue (Avoided Costs)	$ 533,750	$ 39,280	$ 40,009	$ 40,758	$ 41,526	$ 42,315	$ 35,060	$ 35,931	$ 36,824	$ 37,739	$ 38,677	$ 39,638	$ 40,623	$ 41,632	$ 42,667	$ 43,727	$ 44,814	$ 45,927	$ 47,069	$ 48,238	$ 49,437	$ 50,666	$ 51,925	$ 53,215	$ 54,537	$ 55,893
Replace Inverter?	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No
Operations & Maintenance Costs		$ (3,518)	$ (3,624)	$ (3,732)	$ (3,844)	$ (3,960)	$ (4,078)	$ (4,201)	$ (4,327)	$ (4,456)	$ (4,590)	$ (4,728)	$ (4,870)	$ (5,016)	$ (5,166)	$ (5,321)	$ (5,481)	$ (5,645)	$ (5,815)	$ (5,989)	$ (6,169)	$ (6,354)	$ (6,545)	$ (6,741)	$ (6,943)	$ (7,151)
Inverter Replacement Cost		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (150,000)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (150,000)	$ -	$ -	$ -	$ -	$ -
Total Operating Expenses	$ -	$ (3,518)	$ (3,624)	$ (3,732)	$ (3,844)	$ (3,960)	$ (4,078)	$ (4,201)	$ (4,327)	$ (4,456)	$ (154,590)	$ (4,728)	$ (4,870)	$ (5,016)	$ (5,166)	$ (5,321)	$ (5,481)	$ (5,645)	$ (5,815)	$ (5,989)	$ (156,169)	$ (6,354)	$ (6,545)	$ (6,741)	$ (6,943)	$ (7,151)
EBITDA	$ 533,750	$ 35,762	$ 36,386	$ 37,025	$ 37,682	$ 38,355	$ 30,981	$ 31,730	$ 32,497	$ 33,282	$ (115,913)	$ 34,910	$ 35,753	$ 36,617	$ 37,501	$ 38,406	$ 39,333	$ 40,282	$ 41,254	$ 42,249	$ (106,732)	$ 44,312	$ 45,380	$ 46,474	$ 47,594	$ 48,741
Federal Depreciation Expense		$ (259,420)	$ (415,072)	$ (249,043)	$ (149,426)	$ (149,426)	$ (74,713)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
EBIT	$ 533,750	$ (223,658)	$ (378,686)	$ (212,018)	$ (111,744)	$ (111,071)	$ (43,732)	$ 31,730	$ 32,497	$ 33,282	$ (115,913)	$ 34,910	$ 35,753	$ 36,617	$ 37,501	$ 38,406	$ 39,333	$ 40,282	$ 41,254	$ 42,249	$ (106,732)	$ 44,312	$ 45,380	$ 46,474	$ 47,594	$ 48,741
Interest Expense		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
EBT	$ 533,750	$ (223,658)	$ (378,686)	$ (212,018)	$ (111,744)	$ (111,071)	$ (43,732)	$ 31,730	$ 32,497	$ 33,282	$ (115,913)	$ 34,910	$ 35,753	$ 36,617	$ 37,501	$ 38,406	$ 39,333	$ 40,282	$ 41,254	$ 42,249	$ (106,732)	$ 44,312	$ 45,380	$ 46,474	$ 47,594	$ 48,741
Federal taxes saved/(paid)	$ (168,131)	$ 79,532	$ 133,814	$ 75,502	$ 40,429	$ 40,217	$ 16,390	$ (9,995)	$ (10,237)	$ (10,484)	$ 40,570	$ (10,997)	$ (11,262)	$ (11,534)	$ (11,813)	$ (12,098)	$ (12,390)	$ (12,689)	$ (12,995)	$ (13,309)	$ 37,356	$ (13,958)	$ (14,295)	$ (14,639)	$ (14,992)	$ (15,354)
State taxes saved/(paid) [can not deduct federal depreciation expense]	$ (53,375)	$ (3,576)	$ (3,639)	$ (3,703)	$ (3,768)	$ (3,836)	$ (3,098)	$ (3,173)	$ (3,250)	$ (3,328)	$ 11,591	$ (3,491)	$ (3,575)	$ (3,662)	$ (3,750)	$ (3,841)	$ (3,933)	$ (4,028)	$ (4,125)	$ (4,225)	$ 10,673	$ (4,431)	$ (4,538)	$ (4,647)	$ (4,759)	$ (4,874)
Net Income	**$ 312,244**	**$ (147,702)**	**$ (248,511)**	**$ (140,218)**	**$ (75,083)**	**$ (74,689)**	**$ (30,439)**	**$ 18,562**	**$ 19,011**	**$ 19,470**	**$ (63,752)**	**$ 20,422**	**$ 20,916**	**$ 21,421**	**$ 21,938**	**$ 22,467**	**$ 23,010**	**$ 23,565**	**$ 24,134**	**$ 24,716**	**$ (58,702)**	**$ 25,922**	**$ 26,547**	**$ 27,187**	**$ 27,843**	**$ 28,514**

CASH FLOW STATEMENT

Cash From Operations

	Start-Up 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25
Net Income	$ 312,244	$ (147,702)	$ (248,511)	$ (140,218)	$ (75,083)	$ (74,689)	$ (30,439)	$ 18,562	$ 19,011	$ 19,470	$ (63,752)	$ 20,422	$ 20,916	$ 21,421	$ 21,938	$ 22,467	$ 23,010	$ 23,565	$ 24,134	$ 24,716	$ (58,702)	$ 25,922	$ 26,547	$ 27,187	$ 27,843	$ 28,514
Federal Depreciation Expense	$ -	$ 259,420	$ 415,072	$ 249,043	$ 149,426	$ 149,426	$ 74,713	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cash Flow From Operations	$ 312,244	$ 111,718	$ 166,561	$ 108,825	$ 74,343	$ 74,737	$ 44,274	$ 18,562	$ 19,011	$ 19,470	$ (63,752)	$ 20,422	$ 20,916	$ 21,421	$ 21,938	$ 22,467	$ 23,010	$ 23,565	$ 24,134	$ 24,716	$ (58,702)	$ 25,922	$ 26,547	$ 27,187	$ 27,843	$ 28,514

Cash From Investing

Installed PV Cost	$ (1,526,000)																									
One Time State Solar Investment Tax Deduction (Actual Cash Value)	$ 106,820																									
One Time Federal Solar Investment Tax Credit	$ 457,800																									
Cash Flow From Investing	$ (961,380)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Cash From Financing

Loan Disbursement	$ -																									
Loan Repayment (Principle)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cash Flow From Financing	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Annual Cash Flow	**$ (649,136)**	**$ 111,718**	**$ 166,561**	**$ 108,825**	**$ 74,343**	**$ 74,737**	**$ 44,274**	**$ 18,562**	**$ 19,011**	**$ 19,470**	**$ (63,752)**	**$ 20,422**	**$ 20,916**	**$ 21,421**	**$ 21,938**	**$ 22,467**	**$ 23,010**	**$ 23,565**	**$ 24,134**	**$ 24,716**	**$ (58,702)**	**$ 25,922**	**$ 26,547**	**$ 27,187**	**$ 27,843**	**$ 28,514**
Cumulative Cash Flow	**$ (649,136)**	**$ (537,419)**	**$ (370,858)**	**$ (262,033)**	**$ (187,690)**	**$ (112,953)**	**$ (68,679)**	**$ (50,117)**	**$ (31,106)**	**$ (11,636)**	**$ (75,388)**	**$ (54,966)**	**$ (34,050)**	**$ (12,630)**	**$ 9,308**	**$ 31,776**	**$ 54,785**	**$ 78,350**	**$ 102,484**	**$ 127,200**	**$ 68,497**	**$ 94,420**	**$ 120,967**	**$ 148,155**	**$ 175,997**	**$ 204,511**

Simple Payback		**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**
Net Investment	$ (649,136)	$ (537,419)	$ (370,858)	$ (262,033)	$ (187,690)	$ (112,953)	$ (68,679)	$ (50,117)	$ (31,106)	$ (11,636)	$ (75,388)	$ (54,966)	$ (34,050)	$ (12,630)	$ 9,308	$ 31,776	$ 54,785	$ 78,350	$ 102,484	$ 127,200	$ 68,497	$ 94,420	$ 120,967	$ 148,155	$ 175,997	$ 204,511
Simple Payback Year	**14**														14											

DEBT SCHEDULES

Scenario A Loan: Debt Schedule	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25
Beginning Balance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Debt Service	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Principle	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Interest	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Ending Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21	Year 22	Year 23	Year 24	Year 25

TECH ENVIRONMENTAL ENERGY MODEL
MODEL INPUTS FOR BASE CASE (BUILDING CODE)
Lowe's Home Improvement Store

	Units	Value
Building Envelope Inputs		
Number of Buildings	(No.)	1
Total Building Area (Store + 3-Season Room)	(sq. ft.)	121,859
Wall Insulation	(R-value)	12
Roof Insulation	(R-value)	20
Window Insulation	(U-value)	0.45
HVAC Inputs		
Boiler Efficiency	(%)	80%
HVAC Efficiency	(EER)	10.2
Cooling Supply Fan Efficiency	(kW/BHP)	0.75
Bathroom Fan Efficiency	(kW/BHP)	0.75
Duct Sealing	(Yes/No)	No
Duct Leakage Rate	(%)	5%
Programmable Thermostat	(Yes/No)	No
MA Equivalent Full Load Cooling Hours	(Hrs.)	1,200
MA Equivalent Full Load Heating Hours	(Hrs.)	2,000
Heating Design Temperature {Inside/Outside}	(°F)	{65/0}
Cooling Design Temperature {Inside/Outside}	(°F)	{65/95}
Cooling Design Humidity {Inside/Outside}	(Gr W/lbs A)	{60/200}
Lighting & Appliance Inputs		
Lighting Density	(W/sq. ft.)	1.70
Plug Load Density	(W/sq. ft.)	1.02
Refrigerator Power Use	(kW/year)	482
Water Heater Heat Input Rate	(MBtu/hr)	101
Model Btu/CO_2 Emission Factors		
Natural Gas Fuel Heating Value	(Btu/CF)	1,000
Natural Gas Combustion Emission Factor	(lbs/MCF)	120.6
Electrical Use Emission Factor	(lbs/MWh)	1,280

TECH ENVIRONMENTAL ENERGY MODEL
MODEL INPUTS FOR BASE CASE (BUILDING CODE)
Wal-Mart Superstore

	Units	Value
Building Envelope Inputs		
Number of Buildings	(No.)	1
Total Building Area	(sq. ft.)	152,192
Wall Insulation	(R-value)	12
Roof Insulation	(R-value)	20
Window Insulation	(U-value)	0.45
HVAC Inputs		
Boiler Efficiency	(%)	80%
HVAC Efficiency	(EER)	10.6
Cooling Supply Fan Efficiency	(kW/BHP)	0.75
Bathroom Fan Efficiency	(kW/BHP)	0.75
Duct Sealing	(Yes/No)	No
Duct Leakage Rate	(%)	5%
Programmable Thermostat	(Yes/No)	No
MA Equivalent Full Load Cooling Hours	(Hrs.)	1,200
MA Equivalent Full Load Heating Hours	(Hrs.)	2,000
Heating Design Temperature {Inside/Outside}	(°F)	{65/0}
Cooling Design Temperature {Inside/Outside}	(°F)	{65/95}
Cooling Design Humidity {Inside/Outside}	(Gr W/lbs A)	{60/200}
Lighting & Appliance Inputs		
Lighting Density	(W/sq. ft.)	1.70
Plug Load Density	(W/sq. ft.)	0.65
Refrigerator Power Use	(MW/year)	2,580
Water Heater Heat Input Rate	(MBtu/hr)	101
Model Btu/CO_2 Emission Factors		
Natural Gas Fuel Heating Value	(Btu/CF)	1,000
Natural Gas Combustion Emission Factor	(lbs/MCF)	120.6
Electrical Use Emission Factor	(lbs/MWh)	1,280

TE ENERGY MODEL

ENERGY AND CO_2 MODELING FOR SALEM WALMART/LOWE'S PROJECT

***Walmart* - SUPERSTORE**

Walmart	Area (sf)	Electrical Usage (MWh/yr)	Electrical Reduction (%)	Gas Usage (Mcf/yr)	Gas Reduction (%)	Heating CO_2 Emissions (tons/yr)	Electrical CO_2 Emissions (tons/yr)	Total CO_2 Emissions (tons/yr)	CO_2 Emissions Reduction (%)
SUPERSTORE									
Base Case	152,192	5,824.5		7,306.8		440.6	3,727.6	4,168.3	
Energy Efficient HVAC (EER = 11.0)	152,192	5,807.6	0.3%	7,306.8	0.0%	440.6	3,716.9	4,157.6	0.3%
Super Energy Efficient HVAC (EER = 12.6)	152,192	5,751.0	1.3%	7,306.8	0.0%	440.6	3,680.6	4,121.3	1.1%
Daylight Harvesting (25% Lighting Reduction)	152,192	5,437.2	6.7%	8,120.4	-11.1%	489.7	3,479.8	3,969.4	4.8%
Energy Management System	152,192	5,785.9	0.7%	6,734.5	7.8%	406.1	3,703.0	4,109.1	1.4%
Refrigeration Waste Heat Recovery System	152,192	5,824.5	0.0%	7,138.7	2.3%	430.4	3,727.6	4,158.2	0.2%

TE ENERGY MODEL

ENERGY AND CO_2 MODELING FOR SALEM WALMART/LOWE'S PROJECT

***Lowe's* - HOME IMPROVEMENT STORE**

Lowe's	Area (sf)	Electrical Usage (MWh/yr)	Electrical Reduction (%)	Gas Usage (Mcf/yr)	Gas Reduction (%)	Heating CO_2 Emissions (tons/yr)	Electrical CO_2 Emissions (tons/yr)	Total CO_2 Emissions (tons/yr)	CO_2 Emissions Reduction (%)
HOME IMPROVEMENT STORE									
Base Case	121,859	2,917.3		4,306.7		259.7	1,867.1	2,126.8	
Increase Roof Insulation (R-value = 24)	121,859	2,870.3	1.6%	3,899.3	9.5%	235.2	1,837.0	2,072.1	2.6%
Energy Efficient HVAC (EER = 10.5)	121,859	2,906.4	0.4%	4,306.7	0.0%	259.7	1,860.1	2,119.7	0.3%
Super Energy Efficient HVAC (EER = 11.5)	121,859	2,873.8	1.5%	4,306.7	0.0%	259.7	1,839.2	2,098.9	1.3%
Cool Roof Design	121,859	2,860.8	1.9%	4,380.1	-1.7%	264.1	1,830.9	2,095.1	1.5%
Daylight Harvesting (~12% Light Reduction)	121,859	2,852.2	2.2%	4,306.7	0.0%	259.7	1,825.4	2,085.1	2.0%
Energy Management System	121,859	2,885.2	1.1%	3,881.3	9.9%	250.3	1,846.5	2,080.6	2.2%
Purchase 2% Green Power	121,859	2,858.9	2.0%	4,306.7	0.0%	259.7	1,829.7	2,089.4	1.8%

TE ENERGY MODEL

ENERGY AND CO_2 MODELING FOR SALEM WALMART/LOWE'S PROJECT

***Walmart & Lowe's* - TOTAL**

Walmart & Lowe's **TOTAL GHG EMISSIONS**	Area (sf)	Electrical Usage (MWh/yr)	Electrical Reduction (%)	Gas Usage (Mcf/yr)	Gas Reduction (%)	Heating CO_2 Emissions (tons/yr)	Electrical CO_2 Emissions (tons/yr)	Total CO_2 Emissions (tons/yr)	CO_2 Emissions Reduction (%)
Base Case	274,051	8,742		11,614		700	5,595	6,295	
Combined Efficiency Measures									
Preferred Alternative *Increase Roof Insulation (R = 24) (Lowe's)* *Energy Efficient HVAC (EER = 11/10.5)* *Cool Roof Design (Lowe's)* *Daylight Harvesting (12-25% Light Reduction)* *Energy Management System* *Refrigeration Waste Heat Recovery (Wal-Mart)* *Purchase 2% Green Power (Lowe's)*	274,051	8,043	8.0%	10,824	6.8%	652	5,150	5,802	7.8%
Mitigation Alternative *Increase Roof Insulation (R = 24) (Lowe's)* *Super Energy Efficient HVAC (EER = 12.6/11.5)* *Cool Roof Design (Lowe's)* *Daylight Harvesting (12-25% Light Reduction)* *Energy Management System* *Refrigeration Waste Heat Recovery (Wal-Mart)* *Purchase 2% Green Power (Lowe's)*	274,051	7,964	8.9%	10,824	6.8%	652	5,097	5,749	8.7%