# ENERGY AUDIT – FINAL REPORT

# SCHOOL DISTRICT OF THE CHATHAMS
# LAFAYETTE SCHOOL

**221 LAFAYETTE AVENUE**
**CHATHAM, NJ 07928**
**ATTN: RALPH GOODWIN**
**SCHOOL BUSINESS ADMINISTRATOR BOARD SECRETARY**

**CEG PROJECT NO. 9C09078**


# CONCORD ENGINEERING GROUP

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# I. EXECUTIVE SUMMARY

This report presents the findings of an energy audit conducted for:

Lafayette School
221 Lafayette Avenue
Chatham, NJ 07928

Facility Contact Person: John Cataldo
Municipal Contact Person: Ralph Goodwin

This audit was performed in connection with the New Jersey Clean Energy Local Government Energy Audit Program. These energy audits are conducted to promote the office of Clean Energy's mission, which is to use innovation and technology to solve energy and environmental problems in a way that improves the State's economy. This can be achieved through the wiser and more efficient use of energy.

The annual energy costs at this facility are as follows:

| | |
|---|---|
| Electricity | $108,728 |
| Natural Gas | $97,868 |
| Total | $206,596 |

The potential annual energy cost savings for each energy conservation measure (ECM) and renewable energy measure (REM) are shown below in Table 1. Be aware that the ECM's are not additive because of the interrelation of some of the measures. This audit is consistent with an ASHRAE level 2 audit. The cost and savings for each measure is ± 20%. The evaluations are based on engineering estimations and industry standard calculation methods. More detailed analyses would require engineering simulation models, hard equipment specifications, and contractor bid pricing.

**Table 1**
**Financial Summary Table**

| ENERGY CONSERVATION MEASURES (ECM's) | | | | | |
|---|---|---|---|---|---|
| **ECM NO.** | **DESCRIPTION** | **NET INSTALLATION COST[A]** | **ANNUAL SAVINGS[B]** | **SIMPLE PAYBACK (Yrs)** | **SIMPLE LIFETIME ROI** |
| ECM #1 | Lighting Upgrade - General | $13,218 | $2,887 | 4.6 | 446.1% |
| ECM #2 | Lighting Controls | $10,220 | $2,718 | 3.8 | 298.9% |
| ECM #3 | Lighting Upgrade - Gym | $4,500 | $805 | 5.6 | 347.3% |
| ECM #4 | Boiler Replacement – High Efficiency Upgrade | $294,500 | $8,430 | 34.9 | 0.2% |
| ECM #5 | Domestic Water Heater Replacement | $14,692 | $451 | 32.6 | -63.2% |
| ECM #6 | Indoor Air handling Unit Replacement | $37,700 | $2,605 | 14.5 | 3.6% |
| ECM #7 | DDC System – Lafayette Avenue School | $301,072 | $14,531 | 20.7 | -27.6% |
| **RENEWABLE ENERGY MEASURES (REM's)** | | | | | |
| **ECM NO.** | **DESCRIPTION** | **COST[A]** | **ANNUAL SAVINGS[B]** | **SIMPLE PAYBACK (Yrs)** | **SIMPLE LIFETIME ROI** |
| REM #1 | Solar PV Project | $904,590 | $66,284 | 13.6 | 83.2% |

**Notes:** A. Cost takes into consideration applicable NJ Smart StartTM incentives.
B. Savings takes into consideration applicable maintenance savings.

The estimated demand and energy savings for each ECM and REM is shown below in Table 2. The information in this table corresponds to the ECM's and REM in Table 1.

**Table 2**
**Estimated Energy Savings Summary Table**

| ENERGY CONSERVATION MEASURES (ECM's) | | | | |
|---|---|---|---|---|
| **ECM NO.** | **DESCRIPTION** | **ANNUAL UTILITY REDUCTION** | | |
| | | **ELECTRIC DEMAND (KW)** | **ELECTRIC CONSUMPTION (KWH)** | **NATURAL GAS (THERMS)** |
| ECM #1 | Lighting Upgrade - General | 3.9 | 16128.3 | - |
| ECM #2 | Lighting Controls | N/A | 15183.5 | - |
| ECM #3 | Lighting Upgrade - Gym | 2.0 | 4118.4 | - |
| ECM #4 | Boiler Replacement – High Efficiency Upgrade | - | - | 5583.0 |
| ECM #5 | Domestic Water Heater Replacement | - | - | 298.4 |
| ECM #6 | Indoor Air Handling Unit Replacement | 0.4 | 1587.0 | - |
| ECM #7 | DDC System – Lafayette Avenue School | - | 23281.5 | 5141.9 |
| **RENEWABLE ENERGY MEASURES (REM's)** | | | | |
| **ECM NO.** | **DESCRIPTION** | **ANNUAL UTILITY REDUCTION** | | |
| | | **ELECTRIC DEMAND (KW)** | **ELECTRIC CONSUMPTION (KWH)** | **NATURAL GAS (THERMS)** |
| REM #1 | Solar PV Project | 0.4 | 156850.0 | - |

Recommendation:

Concord Engineering Group (CEG) strongly recommends the implementation of all ECM's that provide a calculated simple payback at or under ten (10) years. The following Energy Conservation Measures are recommended for the Lafayette School:

- **ECM #1:** Lighting Upgrade
- **ECM #2:** Install Lighting Controls
- **ECM #3:** Install T-5 Lighting in Gym

ECM #5 does not provide a payback. These systems are past the ASHRAE recommended useful service life and will need to be replaced. The water heaters can be replaced with more efficient equipment that will provide some energy savings and improve the schools carbon foot print.

Systems that have past their useful service life should be replaced such as the systems described in ECM#4 and 6. Although these ECMs will not have a payback in less than 10 years, they are systems that should be replaced and will save a substantial amount of energy as summarized in Table 2 on page 5 and will pay back in the system lifetime.

In addition to the ECMs, there are maintenance and operational measures that can provide significant energy savings and provide immediate benefit. The ECMs listed above represent investments that can be made to the facility which are justified by the savings seen overtime. However, the maintenance items and small operational improvements below are typically achievable with on site staff or maintenance contractors and in turn have the potential to provide substantial operational savings compared to the costs associated. The following are recommendations which should be considered a priority in achieving an energy efficient building:

1. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.
2. Maintain all weather stripping on entrance doors.
3. Clean all light fixtures to maximize light output.
4. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.
5. Confirm that outside air economizers on the rooftop units are functioning properly to take advantage of free cooling and avoid excess outside air during occupied periods.

Efficient HVAC equipment replacements are difficult to justify with the energy savings alone. The replacement of HVAC equipment such as the heating and ventilation units at Lafayette Avenue School is typically initiated when the equipment stops working, surpasses the life expectancy, or maintenance requirements grow beyond the ability to continue to support it. When replacing the equipment becomes necessary, the additional cost to install high efficiency systems becomes a great value for the investment.

The existing facility does not qualify as Pay for Performance project because the average operating demand is below 200 KW.

# II. INTRODUCTION

The Lafayette School is a 75,268 square foot facility that includes classrooms, offices, media center, gymnasium, cafeteria, music room, music tech room, art room and boiler rooms.

Electrical and natural gas utility information is collected and analyzed for one full year's energy use of the building. The utility information allows for analysis of the building's operational characteristics; calculate energy benchmarks for comparison to industry averages, estimated savings potential, and baseline usage/cost to monitor the effectiveness of implemented measures. A computer spreadsheet is used to calculate benchmarks and to graph utility information (see the utility profiles below).

The Energy Use Index (EUI) is established for the building. Energy Use Index (EUI) is expressed in British Thermal Units/square foot/year (BTU/ft$^2$/yr), which is used to compare energy consumption to similar building types or to track consumption from year to year in the same building. The EUI is calculated by converting the annual consumption of all energy sources to BTU's and dividing by the area (gross square footage) of the building. Blueprints (where available) are utilized to verify the gross area of the facility. The EUI is a good indicator of the relative potential for energy savings. A low EUI indicates less potential for energy savings, while a high EUI indicates poor building performance therefore a high potential for energy savings.

Existing building architectural and engineering drawings (where available) are utilized for additional background information. The building envelope, lighting systems, HVAC equipment, and controls information gathered from building drawings allow for a more accurate and detailed review of the building. The information is compared to the energy usage profiles developed from utility data. Through the review of the architectural and engineering drawings a building profile can be defined that documents building age, type, usage, major energy consuming equipment or systems, etc.

The preliminary audit information is gathered in preparation for the site survey. The site survey provides critical information in deciphering where energy is spent and opportunities exist within a facility. The entire site is surveyed to inventory the following to gain an understanding of how each facility operates:

- Building envelope (roof, windows, etc.)
- Heating, ventilation, and air conditioning equipment (HVAC)
- Lighting systems and controls
- Facility-specific equipment

The building site visit is performed to survey all major building components and systems. The site visit includes detailed inspection of energy consuming components. Summary of building occupancy schedules, operating and maintenance practices, and energy management programs provided by the building manager are collected along with the system and components to determine a more accurate impact on energy consumption.

# III. METHOD OF ANALYSIS

Post site visit work includes evaluation of the information gathered, researching possible conservation opportunities, organizing the audit into a comprehensive report, and making recommendations on HVAC, lighting and building envelope improvements. Data collected is processed using energy engineering calculations to anticipate energy usage for each of the proposed energy conservation measures (ECMs). The actual building's energy usage is entered directly from the utility bills provided by the owner. The anticipated energy usage is compared to the historical data to determine energy savings for the proposed ECMs.

It is pertinent to note, that the savings noted in this report are not additive. The savings for each recommendation is calculated as standalone energy conservation measures. Implementation of more than one ECM may in some cases affect the savings of each ECM. The savings may in some cases be relatively higher if an individual ECM is implemented in lieu of multiple recommended ECMs. For example implementing reduced operating schedules for inefficient lighting will result in a greater relative savings. Implementing reduced operating schedules for newly installed efficient lighting will result in a lower relative savings, because there is less energy to be saved. If multiple ECM's are recommended to be implemented, the combined savings is calculated and identified appropriately.

ECMs are determined by identifying the building's unique properties and deciphering the most beneficial energy saving measures available that meet the specific needs of the facility. The building construction type, function, operational schedule, existing conditions, and foreseen future plans are critical in the evaluation and final recommendations. Energy savings are calculated base on industry standard methods and engineering estimations. Energy consumption is calculated based on manufacturer's cataloged information when new equipment is proposed.

Cost savings are calculated based on the actual historical energy costs for the facility. Installation costs include labor and equipment to estimate the full up-front investment required to implement a change. Costs are derived from Means Cost Data, industry publications, and local contractors and equipment suppliers. The NJ SmartStart Building® program incentives savings (where applicable) are included for the appropriate ECM's and subtracted from the installed cost. Maintenance savings are calculated where applicable and added to the energy savings for each ECM. The costs and savings are applied and a simple payback and simple return on investment (ROI) is calculated. The simple payback is based on the years that it takes for the savings to pay back the net installation cost (Net Installation divided by Net Savings.) A simple return on investment is calculated as the percentage of the net installation cost that is saved in one year (Net Savings divided by Net Installation.)

A simple life-time calculation is shown for each ECM. The life-time for each ECM is estimated based on the typical life of the equipment being replaced or altered. The energy savings is extrapolated throughout the life-time of the ECM and the total energy savings is calculated as the total life-time savings.

# IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

The energy usage for the facility has been tabulated and plotted in graph form as depicted within this section. Each energy source has been identified and monthly consumption and cost noted per the information provided by the Owner.

There are three electric services for the facility. The primary service is located at the original boiler room. The secondary service is located at the boiler room in the 2001 addition. A third service for outdoor lighting was not located. The electric usage profile (below) represents the combined total actual electrical usage for the facility. Jersey Central Power and Light (JCP&L) provides electricity to the facility under their General Service Primary Three-Phase rate structure, General Service Secondary Day/Night Three-Phase rate structure and Outdoor Lighting Service. The electric utility measures consumption in kilowatt-hours (KWH) and maximum demand in kilowatts (KW). One KWH usage is equivalent to 1000 watts running for one hour. One KW of electric demand is equivalent to 1000 watts running at any given time. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the historical data received for the facility.

The gas usage profile shows the actual natural gas energy usage for the facility. Public Service Electric and Gas (PSE&G) provides natural gas to the facility under the Basic General Supply Service- Large Volume Gas (LVG) rate structure. Hess Corporation is a third party supplier. The gas utility measures consumption in cubic feet x 100 (CCF), and converts the quantity into Therms of energy. One Therm is equivalent to 100,000 BTUs of energy.

The overall cost for utilities is calculated by dividing the total cost by the total usage. Based on the utility history provide, the average cost for utilities at this facility is as follows:

| Description | Average |
|---|---|
| Electricity | 17.9¢ / kWh |
| Natural Gas | $1.51 / Therm |

**Table 3**
**Electricity Billing Data**

**Electric Usage Summary**

Utility Provider: JCP&L, General Service Secondary 3 phase

Meter: S07013739 Customer Number: 0801577897 0000554662
Meter: Customer Number: 0800644719 0003075605
Meter: Customer Number: 0800644719 0005007742

| MONTH OF USE | CONSUMPTION KWH | DEMAND | TOTAL BILL |
|---|---|---|---|
| Aug-08 | 55,946 | 144.1 | $10,586 |
| Sep-08 | 54,920 | 259.8 | $9,944 |
| Oct-08 | 60,359 | 177.5 | $10,196 |
| Nov-08 | 61,423 | 171.1 | $10,575 |
| Dec-08 | 55,646 | 152.3 | $9,859 |
| Jan-09 | 58,364 | 149.9 | $10,271 |
| Feb-09 | 54,648 | 147.2 | $9,567 |
| Mar-09 | 43,029 | 273.8 | $7,794 |
| Apr-09 | 37,031 | 140.4 | $6,755 |
| May-09 | 52,021 | 198.8 | $9,270 |
| Jun-09 | 38,221 | 157.7 | $7,104 |
| Jul-09 | 36,027 | 159.9 | $6,807 |
| **Totals** | **607,635** | **273.8 Max** | **$108,728** |

**AVERAGE DEMAND 177.7 KW average**
**AVERAGE RATE $0.179 $/kWh**

**Figure 1**
**Electricity Usage Profile**

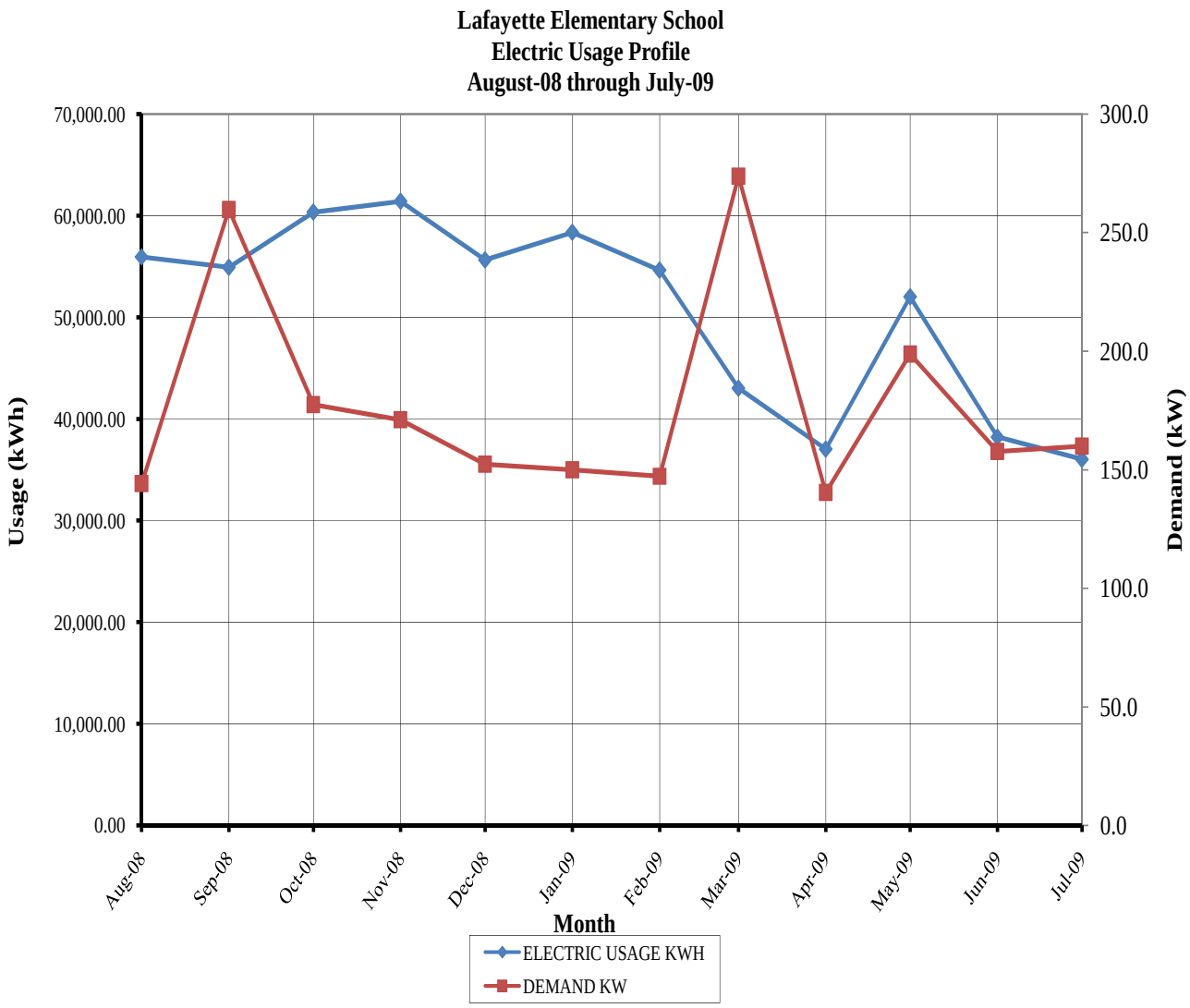


**Table 4**
**Natural Gas Billing Data**

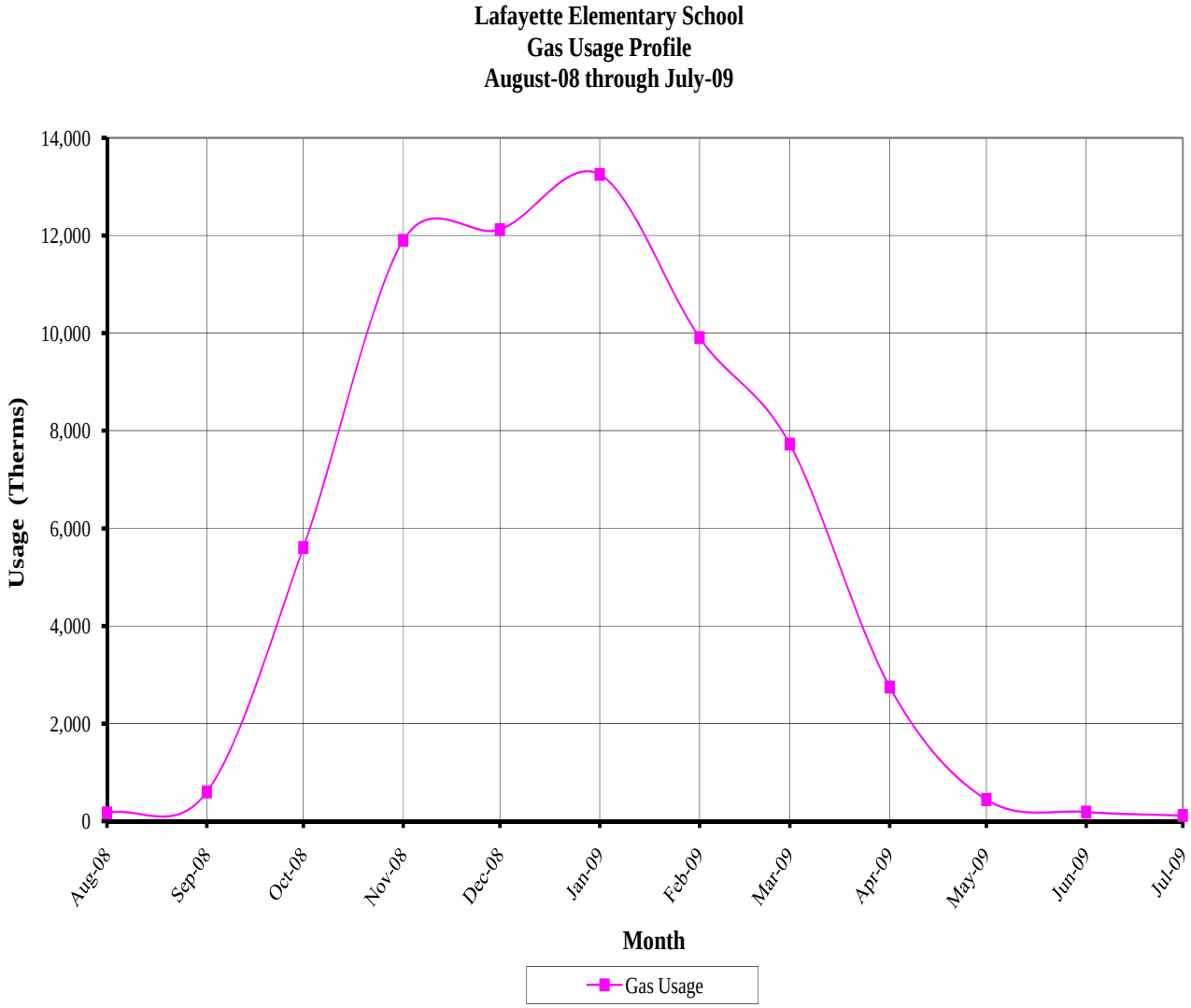
**Natural Gas Usage Summary**

Utility Provider: PSE&G 3164343
PoD ID: PG000009458410904631
Third Party Utility Provider: HESS
HESS Meters: 394872/394899

| MONTH OF USE | CONSUMPTION (THERMS) | TOTAL BILL |
|---|---|---|
| Aug-08 | 174.42 | $333.09 |
| Sep-08 | 600.23 | $894.11 |
| Oct-08 | 5,609.23 | $9,556.05 |
| Nov-08 | 11,904.14 | $18,224.70 |
| Dec-08 | 12,125.22 | $18,584.82 |
| Jan-09 | 13,253.04 | $20,123.96 |
| Feb-09 | 9,907.93 | $15,488.39 |
| Mar-09 | 7,729.24 | $10,091.60 |
| Apr-09 | 2,751.75 | $3,667.51 |
| May-09 | 445.77 | $679.57 |
| Jun-09 | 191.69 | $116.11 |
| Jul-09 | 118.21 | $107.83 |
| **TOTALS** | **64,810.85** | **$97,867.74** |

**AVERAGE RATE:** **$1.510** **$/THERM**

**Figure 2**
**Natural Gas Usage Profile**



B. Energy Use Index (EUI)

Energy Use Index (EUI) is a measure of a building's annual energy utilization per square foot of building. This calculation is completed by converting all utility usage consumed by a building for one year, to British Thermal Units (BTU) and dividing this number by the building square footage. EUI is a good measure of a building's energy use and is utilized regularly for comparison of energy performance for similar building types. The Oak Ridge National Laboratory (ORNL) Buildings Technology Center under a contract with the U.S. Department of Energy maintains a Benchmarking Building Energy Performance Program. The ORNL website determines how a building's energy use compares with similar facilities throughout the U.S. and in a specific region or state.

Source use differs from site usage when comparing a building's energy consumption with the national average. Site energy use is the energy consumed by the building at the building site only. Source energy use includes the site energy use as well as all of the losses to create and distribute the energy to the building. Source energy represents the total amount of raw fuel that is required to operate the building. It incorporates all transmission, delivery, and production losses, which allows for a complete assessment of energy efficiency in a building. The type of utility purchased has a substantial impact on the source energy use of a building. The EPA has determined that source energy is the most comparable unit for evaluation purposes and overall global impact. Both the site and source EUI ratings for the building are provided to understand and compare the differences in energy use.

The site and source EUI for this facility is calculated as follows. (See Table 5 for details):

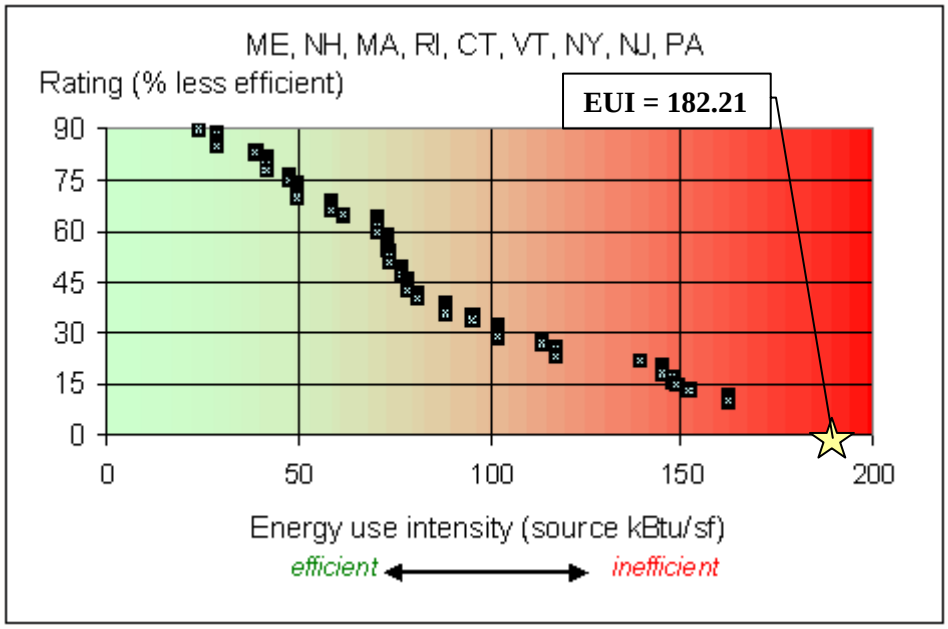
$$Building\ \ Site\ EUI = \frac{(Electric\ Usage\ in\ kBtu + Gas\ Usage\ in\ kBtu)}{Building\ \ Square\ \ Footage}$$

$$Building\ \ Source\ EUI = \frac{(Electric\ Usage\ in\ kBtu\ \ x\ SS\ \ Ratio + Gas\ Usage\ in\ kBtu\ \ x\ SS\ \ Ratio)}{Building\ \ Square\ \ Footage}$$

**Table 5**
**Lafayette School EUI Calculations**

| ENERGY USE INTENSITY CALCULATION | | | | | | |
|---|---|---|---|---|---|---|
| ENERGY TYPE | BUILDING USE | | | SITE ENERGY | SITE-SOURCE RATIO | SOURCE ENERGY |
| | kWh | Therms | Gallons | kBtu | | kBtu |
| ELECTRIC | 607635.0 | | | 2,074,466 | 3.340 | 6,928,716 |
| NATURAL GAS | | 64810.9 | | 6,481,085 | 1.047 | 6,785,696 |
| FUEL OIL | | | 0.0 | 0 | 1.010 | 0 |
| PROPANE | | | 0.0 | 0 | 1.010 | 0 |
| TOTAL | | | | 8,555,551 | | 13,714,412 |
| *Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007. | | | | | | |
| **BUILDING AREA** | | 75,268 | SQUARE FEET | | | |
| **BUILDING SITE EUI** | | *113.67* | kBtu/SF/YR | | | |
| **BUILDING SOURCE EUI** | | *182.21* | kBtu/SF/YR | | | |

**Figure 3**
**Source Energy Use Intensity Distributions: Elementary Schools**



C. EPA Energy Benchmarking System

The United States Environmental Protection Agency (EPA) in an effort to promote energy management has created a system for benchmarking energy use amongst various end users. The benchmarking tool utilized for this analysis is entitled Portfolio Manager. The Portfolio Manager tool allows tracking and assessment of energy consumption via the template forms located on the ENERGY STAR website (www.energystar.gov). The importance of benchmarking for local government municipalities is becoming more important as utility costs continue to increase and emphasis is being placed on carbon reduction, greenhouse gas emissions and other environmental impacts.

Based on information gathered from the ENERGY STAR website, Government agencies spend more than $10 billion a year on energy to provide public services and meet constituent needs. Furthermore, energy use in commercial buildings and industrial facilities is responsible for more than 50 percent of U.S. carbon dioxide emissions. It is vital that local government municipalities assess facility energy usage, benchmark energy usage utilizing Portfolio Manager, set priorities and goals to lessen energy usage and move forward with priorities and goals.

In accordance with the Local Government Energy Audit Program, CEG has created an ENERGY STAR account for the municipality to access and monitoring the facility's yearly energy usage as it compares to facilities of similar type. The following is the user name and password for this account:

https://www.energystar.gov/istar/pmpam/index.cfm?fuseaction=login.login

[redacted]

The utility bills and other information gathered during the energy audit process are entered into the Portfolio Manager. The following is a summary of the results for the facility:

**Table 6**
**ENERGY STAR Performance Rating**

| FACILITY DESCRIPTION | ENERGY PERFORMANCE RATING | NATIONAL AVERAGE |
|---|---|---|
| Lafayette School | 25 | 50 |

Refer to the Statement of Energy Performance appendix for the detailed energy summary.

# V. FACILITY DESCRIPTION

The Lafayette School is a one-story, block with brick faced building. The facility houses the boiler rooms, kitchen, cafeteria, offices, classrooms, gymnasium, locker rooms, restrooms, media center, general music, art room, tech labs and the boiler room. The original building was approximately 39,862 square feet and was built in 1953. There were additions in 1995 that added approximately 12,438 square feet, an addition in 2001 added approximately 10,425 square feet, and an addition in 2006 added 12,543 square feet, bringing the building total to 75,268 square feet. The building operates for 40 hours during a typical week. There are different roof types on the building. There is an asphalt shingle roof on the original building The 1995, 2001 and 2006 additions have rigid insulation on steel deck on steel beams. The windows are tempered, insulated glass with aluminum frame.

Heating System

There are two boiler plants providing hot water for heating and there are natural gas fired roof top air handling units that provide heat for this facility. The boiler plant in the original building consists of two (2) Cyclotherm model 3500W-W4-SP, 4,190 MBH Natural Gas input each, natural gas burner water boilers, are 80% efficient, in poor condition and were manufactured in 1953. These boilers provide heating hot water to unit heaters, unit ventilators, convectors, heat & ventilation unit, and radiant floor panels. There are two 7.5 hp system pumps piped in parallel located in the original boiler room and operating in a lead/lag configuration. These pumps are approximately 10 years old and in good to fair condition with 90.2% motor efficiency. The seven (7) packaged roof top units with natural gas heat have inputs ranging from 50,000 BTUH up to 390,000 BTUH and are 81% efficient. There are five (5) units that are three (3) years old and are in very good condition. There are two (2) units that are eight (8) years old and are in fair condition. There is one (1) heat and ventilation unit that is original to the building and is in poor condition.

The 2001 addition added a boiler plant that serves the 2001 addition. The boiler is a HB Smith model Series 28A-8 cast iron boiler, 2499 maximum MBH natural gas input and is 82.9% efficient. The boiler is eight years old and in good condition. There are two 5 hp system pumps piped in parallel located in the 2001 addition boiler room and operating in a lead/lag configuration. The pumps are eight years old and are in fair condition.

Domestic Hot Water

There is an A.O. Smith model HW 200M 942, natural gas, domestic water heater provides hot water for the original building. This unit has an input of 199,000 Btu/h, and a recovery rate of 181.0 gallons per hour, is 82% thermal efficient. The water heater was manufactured in 1998 and is in fair condition.

There is an A.O. Smith model BTR 120 110, natural gas, domestic water heater provides hot water for the 2001 addition. This unit has an input of 120,000 Btu/h, 71 gallon tank and a recovery rate of 116.4 gallons per hour, is 80% thermal efficient. The water heater was manufactured in 2001 and is in good condition.

Cooling System

The facility is cooled via thirty-two (32) split system air conditioning systems, five (5) window air conditioners and seven (7) roof top units. All cooling units are air cooled, direct expansion cooling. These units vary in sizes ranging from 0.75 nominal tons to 25 nominal tons. The split systems are three (3) to thirteen (13) years old and range from good to fair condition. The window air conditioners are four (4) years old and are in good condition.

The seven (7) roof top units are heating and cooling and are described in the heating section above. Again, there are five (5) units that are three (3) years old and are in very good condition and there are two (2) units that are eight (8) years old and are in fair condition.

Controls System

There are Johnson Controls pneumatic controls serving the original boiler room and original school building. A Quincy air compressor, approximately 3 years old, with (2) 2hp motors provides air to the controls system. The system operates on a hot water reset schedule as follows: 0°F Outside air temperature (OA): 200°F Leaving Water Temperature (LWT), 15°F Outside air temperature (OA): 175°F Leaving Water Temperature (LWT), 30°F Outside air temperature (OA): 150°F Leaving Water Temperature (LWT), 45°F Outside air temperature (OA): 125°F Leaving Water Temperature (LWT), 60°F Outside air temperature (OA): 100°F Leaving Water Temperature (LWT). The system appears to be operational but is antiquated.

Exhaust System

There are many roof top centrifugal fans exhausting the toilet rooms, kitchen, all purpose room and locker room areas. They are fractional horse power fan motors and the largest exhaust fans is less than 1 horsepower.

Lighting

The building is lit by varying types and sizes of light bulb types. The types used include the use of T-12 fluorescent, T-8 fluorescent, incandescent, halogen and compact fluorescent. The lamp wattages range from 26 watts to 150 watts with the majority being fluorescent T8 light fixtures with 32 Watt lamps. The incandescent lamps range from 100 watts to 150 watts. There are 25 LED exit signs.

# VI. MAJOR EQUIPMENT LIST

The equipment list is considered major energy consuming equipment and through energy conservation measures could yield substantial energy savings. The list shows the major equipment in the facility and all pertinent information utilized in energy savings calculations. An approximate age was assigned to the equipment in some cases if a manufactures date was not shown on the equipment's nameplate. The ASHRAE service life for the equipment along with the remaining useful life is also shown in the Appendix.

Refer to the **Major Equipment List Appendix** for this facility.

# VII. ENERGY CONSERVATION MEASURES

## ECM #1: Lighting Upgrade - General

**Description: General**

The lighting in the Lafayette School is primarily made up of fluorescent fixtures with T-12 lamps and magnetic ballasts, T-8 lamps with electronic ballasts, incandescent lamps and compact fluorescent lamps. There are a few storage rooms, original boiler room and closets with incandescent lighting and compact fluorescent fixtures.

This ECM includes replacement of the existing fixtures containing T12 lamps and magnetic ballasts with fixtures containing T8 lamps and electronic ballasts. The new energy efficient, T8 fixtures will provide adequate lighting and will save the owner on electrical costs due to the better performance of the lamp and ballasts. This ECM will also provide maintenance savings through the reduced number of lamps replaced per year. The expected lamp life of a T8 lamp is approximately 30,000 burn-hours, in comparison to the existing T12 lamps which is approximately 20,000 burn-hours. The facility will need 33% less lamps replaced per year.

This ECM also includes replacement of all incandescent lamps to compact fluorescent lamps. The energy usage of an incandescent compared to a compact fluorescent approximately 3 to 4 times greater. In addition to the energy savings, compact fluorescent fixtures burn-hours are 8 to 15 times longer than incandescent fixtures ranging from 6,000 to 15,000 burn-hours compared to incandescent fixtures ranging from 750 to 1000 burn-hours.

**Energy Savings Calculations:**

The **Grade Lighting Audit ECM#1- General Appendix** outlines the proposed retrofits, costs, savings, and payback periods.

NJ Smart Start® Program Incentives are calculated as follows:

From the **Smart Start Incentive Appendix**, the replacement of a T-12 fixture to a T-5 or T-8 fixture warrants the following incentive: T-5 or T-8 (1-2 lamp) = $25 per fixture; T-5 or T-8 (3-4 lamp) = $30 per fixture.

$$\text{Smart Start®}\ Incentive = (\#\ of\ 1-2\ lamp\ \ fixtures \times\ \$\ 25) + (\#\ of\ 3-4\ lamp\ \ fixtures \times\ \$\ 30)$$
$$\text{Smart Start®}\ Incentive = (4 \times\ \$\ 25) = \underline{\$100}$$

Replacement and Maintenance Savings are calculated as follows:

$$Savings = T12\cos t - T8\cos t$$

96T12: 2 fixtures x 2 lamps x ($4.30/lamp+ $5 labor/lamp) x 25 years x 2080 hrs/yr / 20,000 hours/lamp = $96.72
40T12: 2 fixtures x 1 lamp x ($1.95/lamp+ $5 labor/lamp) x 25 years x 2080 hrs/yr / 20,000 hours/lamp = $36.14

T12 cost = 96T12 + 40T12 = $96.72 + $36.14 = $132.86 lifetime cost

32T8: 10 lamps x ($1.95/lamp+ $5 labor/lamp) x 25 years x 2080 hrs/yr / 30,000 hours/lamp = $120.47

Savings = T12 cost – T8 cost = $132.86 - $120.47 = $12.39 lifetime maintenance and cost savings

From the **Smart Start Incentive Appendix**, there is no incentive for replacing incandescent lamps with compact fluorescent lamps. The incentive is only available if the entire light fixture is replaced. In most cases, the existing fixtures can be re-lamped by the facility's staff to obtain the energy savings without the expense of a new fixture and the involvement of an electrician to install a new fixture.

**Energy Savings Summary:**

| ECM #1 - ENERGY SAVINGS SUMMARY | |
|---|---|
| **Installation Cost ($):** | $13,218 |
| **NJ Smart Start Equipment Incentive ($):** | $0 |
| **Net Installation Cost ($):** | $13,218 |
| **Maintenance Savings ($/Yr):** | $0 |
| **Energy Savings ($/Yr):** | $2,887 |
| **Total Yearly Savings ($/Yr):** | $2,887 |
| **Estimated ECM Lifetime (Yr):** | 25 |
| **Simple Payback** | 4.6 |
| **Simple Lifetime ROI** | 446.1% |
| **Simple Lifetime Maintenance Savings** | $12 |
| **Simple Lifetime Savings** | $72,186 |
| **Internal Rate of Return (IRR)** | 22% |
| **Net Present Value (NPV)** | $37,061.61 |

* ECM#1 Calculations DO NOT include lighting control changes implemented in ECM#2. If ECM#1 and #2 are implemented together the savings will be relatively lower than shown above.

## ECM #2: Install Lighting Controls

**Description:**

In some areas the lighting is left on unnecessarily. There has been a belief that it is better to keep the lights on rather than to continuously switch them on and off. This on/off dilemma was studied, and it was determined that the best option is to turn the lights off whenever possible. Although this practice reduces the lamp life, the energy savings far outweigh the lamp replacement costs.

Lighting controls are available in many forms. Lighting controls can be as simplistic as an additional switch. Timeclocks are often used which allow the user to set an on/off schedule. Timeclocks range from a dial clock with on/off indicators to a small box the size of a thermostat with user programs for on/off schedule in digital format. Occupancy sensors detect motion and will switch the lights on when the room is occupied. They can either be mounted in place of the current wall switch, or they can be mounted on the ceiling to cover large areas. Lastly, photocells are a lighting control that sense light levels and will turn the lights off when there is adequate daylight. These are mostly used outside, but they are becoming much more popular in energy-efficient office designs as well.

To determine an estimated savings for lighting controls, we used ASHRAE 90.1-2004 (NJ Energy Code). Appendix G states that occupancy sensors have a 10% power adjustment factor for daytime occupancies for buildings over 5,000 SF. CEG recommends the installation of dual technology occupancy sensors in all private offices, conference rooms, restrooms, lunch rooms, storage rooms, lounges, file rooms, etc.

**Energy Savings Calculations:**

The **Investment Grade Lighting Audit ECM#2- Lighting Controls Appendix** outlines the proposed retrofits, costs, savings, and payback periods. The hallways of the building is a 24/7 facility while the majority of the building is only occupied 40 hours a week and other areas are only a few hours a day. Ten percent of this value is the resultant energy savings due to installation of occupancy sensors and was calculated to be 15,183.5 kWh/year and $2,718/year.

Installation cost per dual-technology sensor (Basis: Sensorswitch or equivalent) is $160/unit including material and labor. The SmartStart Buildings® incentive is $20 per control which equates to an installed cost of $140/unit. Total number of rooms to be retrofitted is 73. Total cost to install sensors is $140/ceiling unit x 73 units = $10,220.

**Energy Savings Summary:**

| ECM #2 - ENERGY SAVINGS SUMMARY | |
|---|---|
| **Installation Cost ($):** | $11,680 |
| **NJ Smart Start Equipment Incentive ($):** | $1,460 |
| **Net Installation Cost ($):** | $10,220 |
| **Maintenance Savings ($/Yr):** | $0 |
| **Energy Savings ($/Yr):** | $2,718 |
| **Total Yearly Savings ($/Yr):** | $2,718 |
| **Estimated ECM Lifetime (Yr):** | 15 |
| **Simple Payback** | 3.8 |
| **Simple Lifetime ROI** | 298.9% |
| **Simple Lifetime Maintenance Savings** | $0 |
| **Simple Lifetime Savings** | $40,770 |
| **Internal Rate of Return (IRR)** | 26% |
| **Net Present Value (NPV)** | $22,227.31 |

## ECM #3: Install T-5 Lighting System in Gym

**Description:**

The Gym is currently lit via eighteen (18) HID, 250 W Metal Halide fixtures that are mounted approximately 20'-0" above the finished floor. The lighting system is antiquated and the space would be better served with a more efficient, fluorescent lighting system. Studies have shown that metal halide lighting systems have a steep lumen depreciation rate (rate at which light is produced from fixture) which equates to approximately a 26% to 35% reduction in lighting output at 40% of the rated lamp life. In addition, the new fluorescent system will provide a better quality of light and save the Owner many dollars on replacement of the highly expensive metal halide lamps.

CEG recommends upgrading the lighting within the Gym to an energy-efficient T-5 lighting system that includes new lighting fixtures with high efficiency, electronic ballasts and T-5 high output (HO) lamps. The T-5 HO lamps are rated for 20,000 hours versus the 10,000 hours for the 250W Metal Halide lamps so there would be a savings in replacement cost and labor. In addition to the standard lighting features of the T-5 fixtures; a day-lighting option could be selected for the outside rows of light to take advantage of the natural daylight that provides light to the room during the day via the clerestory.

This measure replaces all the HID, 250 W Metal Halide fixtures in the Gym with a well-designed T-5 lighting system. Approximately twenty (18), 3-lamp T5HO high bay fixtures with reflectors and high-efficiency, electronic ballasts will be required in order to meet the mandated 50 foot-candle average within the Gym.

**Energy Savings Calculations:**

A detailed **Grade Lighting Audit ECM#3- T-5 Lighting System in Gym Appendix** that outlines the proposed retrofits, costs, savings, and payback periods.

NJ Smart Start® Program Incentives are calculated as follows:

From Appendix C, the replacement of a 250 W HID fixture to a T-5 or T-8 fixture warrants the following incentive: $50 per fixture.

$$\text{Smart Start®}\ Incentive = (\#\ of\ \ fixtures \times\ \$50) = (18 \times \$50) = \underline{\$900}$$

Maintenance savings are calculated based on the facility operational hours as indicated by the Owner. For the Gym, the estimated operational hours are 2,080 hours per year. Based on the lamp life comparison, there will be five (5) complete lamp replacements required for the metal halide system at the time when two (2) complete lamp replacement would be required for the fluorescent lighting system. Based on industry pricing, the lamp cost for a 250W metal halide lamp is approximately ±$25 per lamp and a T-5 54HO fluorescent lamp is approximately ±$5 per lamp. Therefore, the maintenance savings are calculated as follows:

$$Maintenance\ Savings = (\#\ of\ \ MH\ \ lamps \times\ \$25\ \ per\ lamp) - (\#\ of\ \ T5HO\ lamps \times \$5\ \ per\ lamp)$$

$$Maintenance\ Savings = (90\ lamps \times \$25\ per\ lamp) - (108\ lamps \times \$5\ per\ lamp) = \$1{,}710$$

= $1,710 / 25 years = $68/year average maintenance savings

It is pertinent to note, that installation labor was not included in the maintenance savings.

| ECM #3 - ENERGY SAVINGS SUMMARY | |
|---|---|
| **Installation Cost ($):** | $5,400 |
| **NJ Smart Start Equipment Incentive ($):** | $900 |
| **Net Installation Cost ($):** | $4,500 |
| **Maintenance Savings ($/Yr):** | $68 |
| **Energy Savings ($/Yr):** | $737 |
| **Total Yearly Savings ($/Yr):** | $805 |
| **Estimated ECM Lifetime (Yr):** | 25 |
| **Simple Payback** | 5.6 |
| **Simple Lifetime ROI** | 347.3% |
| **Simple Lifetime Maintenance Savings** | $1,700 |
| **Simple Lifetime Savings** | $20,130 |
| **Internal Rate of Return (IRR)** | 18% |
| **Net Present Value (NPV)** | $9,520.89 |

## ECM #4: Boiler Replacement – High Efficiency Upgrade

**Description:**

Heating is provided to the facility by two heating plants. The original heating plant, built in 1953 is outdated and can be more efficient. The newer heating plant, built in 2001 is adequately efficient and should remain in service.

In regards to the original plant, there are two (2) two Cyclotherm model 3500W-W4-SP, 4,190 MBH Natural Gas input each, natural gas burner water boilers, which have a combustion efficiency of 80% when new. These boilers are 21 years past its ASHRAE useful service life.

This energy conservation measure will replace the gas fired boilers serving the original facility. The calculation is based on the following equipment: Aerco, Benchmark BMK-3.0LN-3 condensing boiler or equivalent. The existing units will be replaced with high energy efficient units with capacities typical of the existing units.

**Energy Savings Calculations:**

Existing 4,190 MBH Gas Fired Boiler:

Rated Capacity = 8,380 MBh Input, 6,700 MBh Output (Natural Gas)

Combustion Efficiency = 80%
Age & Radiation Losses = 5%
Thermal Efficiency = 75%

Replacement Gas Fired Boiler:

High-Efficiency Gas Fired Boiler

Rated Capacity = 9,000 MBh Input, 8,343 MBh maximum Output (Natural Gas)

Combustion Efficiency = 86.5%
Radiation Losses = 0.5%
Thermal Efficiency = 86%

Operating Data:

Heating Season Fuel Consumption = 43,648 Therms of natural (based on natural gas billing data and the square footage of the facility).

$$Heating\ Energy\ Savings = Fuel\ Consumption \times (New\ Furnace\ Efficiency - Old\ Furnace\ Efficiency)$$

Heating Energy Savings = 43,648 Therms x ((86% - 75%) / (86%)) = 5,583 Therms

Total Heating Cost savings

Heating Energy Cost Savings = Annual Energy Savings x $/Therm

Heating Energy Cost Savings = (5,583 Therms) x $1.51/Therm = $8,430/ yr.

Installed cost of (3) three new BMK3.0 LN 460/4, IRI 3000MBH input gas fired boilers with one (1) BMS II sequencing panel, sensor kit and installation is $294,500.

Equipment Incentives:

Heating Smart Start Equipment Incentive = ($1.75/MBh) = (9,000 MBh ) x $1.75 = $15,750

**Energy Savings Summary:**

| ECM #4 - ENERGY SAVINGS SUMMARY | |
|---|---|
| **Installation Cost ($):** | $294,500 |
| **NJ Smart Start Equipment Incentive ($):** | $0 |
| **Net Installation Cost ($):** | $294,500 |
| **Maintenance Savings ($/Yr):** | $0 |
| **Energy Savings ($/Yr):** | $8,430 |
| **Total Yearly Savings ($/Yr):** | $8,430 |
| **Estimated ECM Lifetime (Yr):** | 35 |
| **Simple Payback** | 34.9 |
| **Simple Lifetime ROI** | 0.2% |
| **Simple Lifetime Maintenance Savings** | $0 |
| **Simple Lifetime Savings** | $295,050 |
| **Internal Rate of Return (IRR)** | 0% |
| **Net Present Value (NPV)** | ($113,362.73) |

## ECM #5: Domestic Water Heater Replacement

**Description:**

The existing domestic water heater (WH-1) is a A.O. Smith model HW-200M with 199,000 BTUH input natural gas heater with 82% thermal efficiency and (WH-2) is a is a A.O Smith model BTR-120 with a 71 gallon tank and 120,000 BTUH input natural gas heater with an 80% thermal efficiency and a nameplate recovery rate of 116 gallons per hour.

This energy conservation measure will replace the existing natural WH-1 with a 92% thermal efficient Bradford White model EF-60T-199E-3N gas fired domestic hot water heater having 199 MBH input and 60-gallon storage capacity or equivalent. This energy conservation measure will replace the existing natural WH-2 with a 96% thermal efficient Bradford White model EF-60T-125E-3NA gas fired domestic hot water heater having 125 MBH input and 60-gallon storage capacity or equivalent. This ECM requires coordination with the utility due to increase in natural gas demand for the facility. CEG advises the owner to contact the utility provider regarding the installation of this ECM.

**Energy Savings Calculations:**

Existing Natural Gas DW Heater (WH1)
Rated Capacity = 199 MBH input
Combustion Efficiency = 82%
Age & Radiation Losses = 5%
Thermal Efficiency = 77%

Proposed Natural Gas-Fired, High-Efficiency DW Heater (WH1)
Rated Capacity = 199 MBH input; 60 gallons storage
Thermal Efficiency = 92%
Radiation Losses = 0.5%
Net Efficiency = 91.5%

Existing Natural Gas DW Heater (WH2)
Rated Capacity = 120 MBH input; 71 gallons storage
Combustion Efficiency = 80%
Age & Radiation Losses = 5%
Thermal Efficiency = 75%

Proposed Natural Gas-Fired, High-Efficiency DW Heater (WH2)
Rated Capacity = 125 MBH input; 60 gallons storage
Thermal Efficiency = 96%
Radiation Losses = 0.5%
Net Efficiency = 95.5%

Operating Data for DW Heater

# Natural Gas Equipment List - Estimated Annual Usage per unit

**Concord Engineering Group**

**Lafayette Avenue School**

| Location | Qty. | Model # | Serial # | Input (MBh) | % of Total Input | Estimated Annual Therms |
|---|---|---|---|---|---|---|
| Boiler Room 1 (B1) | 1 | 3500W-W4-SP | 7481 | 4190 | 33.67% | E |
| Boiler Room 1 (B2) | 1 | 3500W-W4-SP | 7480 | 4190 | 33.67% | 21,824.11 |
| Boiler Room 2 (B3) | 1 | 28A-8 | N2001-810 | 2499 | 20.08% | 13,016.34 |
| Rooftop (RTU-1) | 1 | RM-025-8-0-BA02-369 | 200612-AMGR29908 | 390 | 3.13% | 2,031.36 |
| Rooftop (RTU-2) | 1 | RM-A05-8-0-BB01-339 | 200612-AMGE29896 | 180 | 1.45% | 937.55 |
| Rooftop (RTU-3) | 1 | RM-A02-1-0-BA01-319 | 200612-AMGB29897 | 69 | 0.55% | 359.39 |
| Rooftop (RTU-4) | 1 | RM-A02-1-0-BA01-319 | 200612-AMGB29898 | 69 | 0.55% | 359.39 |
| Rooftop (RTU-5) | 1 | RM-008-8-0-BB02-339 | 200611-AMGH29881 | 180 | 1.45% | 937.55 |
| Rooftop | 1 | RMF100NG317BH3BB01A4501B0DD31 | N0912011001 | 285 | 2.29% | 1,484.46 |
| Rooftop | 1 | 48HJD006---531HE | 1301G24542 | 72 | 0.58% | 375.02 |
| Boiler Room 1 | 1 | HW 200M 942 | 942 B 98 43192 | 199 | 1.60% | 1,036.52 |
| Boiler Room 2 | 1 | BTR 120 110 | MD011025 463 | **120** | 0.96% | **625.03** |
| | | | Total Input MBH | **12,443** | | |
| | | | Total Input Therms | 124.4 | | |
| | | | Total Gas Consumption Therms / yr. | 64810.85 | | |

$$\text{Estimated Consumption(WH1)} = \frac{199 MBH input}{12{,}443 MBH bldg input} x 64{,}810.85 Therms / year = 1036.52 Therms / year$$

$$\text{Estimated Consumption(WH2)} = \frac{120 MBH input}{12{,}443 MBH bldg input} x 64{,}810.85 Therms / year = 625.03 Therms / year$$

Energy Savings = Old Water Heater Energy Input x ((New Water Heater Efficiency – Old Water Heater) / New Water Heater Efficiency))

Energy Savings (WH1) = 1036.52 Therms x ($\underline{91.5\% - 77\%}$) = 164.26 Therms
(91.5%)

Energy Savings (WH2) = 625.03 Therms x ($\underline{95.5\% - 75\%}$) = 134.17 Therms
(95.5%)

Total Energy Savings = (WH1) + (WH2) = 164.26 Therms + 134.17 Therms = 298.43 Therms

Average Cost of Natural Gas = $1.51/Therm

Yearly Savings = 298.43 Therm x $1.51/ Therm = $451/year

Cost of (2) two Commercial Domestic Water Heater and Installation = $15,340

Simple Payback = $15,340 / $451 = 34 years

Smart Start Incentive = $2.00/MBh x (199+125) /installed MBh = $648.

**Energy Savings Summary:**

| ECM #5 - ENERGY SAVINGS SUMMARY | |
|---|---|
| **Installation Cost ($):** | $15,340 |
| **NJ Smart Start Equipment Incentive ($):** | $648 |
| **Net Installation Cost ($):** | $14,692 |
| **Maintenance Savings ($/Yr):** | $0 |
| **Energy Savings ($/Yr):** | $451 |
| **Total Yearly Savings ($/Yr):** | $451 |
| **Estimated ECM Lifetime (Yr):** | 12 |
| **Simple Payback** | 32.6 |
| **Simple Lifetime ROI** | -63.2% |
| **Simple Lifetime Maintenance Savings** | $0 |
| **Simple Lifetime Savings** | $5,412 |
| **Internal Rate of Return (IRR)** | -13% |
| **Net Present Value (NPV)** | ($10,202.74) |

## ECM #6: Indoor Air Handling Unit Replacement

**Description:**

One (1) indoor air handling units with hot water heating coils have surpassed there expected service life of fifteen (15) years as outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook. These units appear to be 1953 vintage, and are excellent candidates for replacement. Due to escalating owning and maintenance costs, these units should be replaced. Each of these units contains a hot water heating section and savings can we yielded from year round operation. The unit is 12,600 CFM (cubic feet per minute) capacity.

This energy conservation measure would replace the air handling unit with fan motors equal to or greater than 1 HP with units having NEMA Premium® Efficient Motors. NEMA Premium® is the most efficient motor designation in the marketplace today. The Trane M-series or equivalents were utilized as a basis of design. Because many units operate 40-80 hours per week, even small increases in efficiency can yield substantial energy and dollar savings.

**Energy Savings Calculations:**

Existing: Unit in Original Boiler Room has a fan motor with the following characteristics:
Existing Motor Efficiency = 78%
Existing motor HP = 5 HP
Annual Hours of Operations = 4500 (Average)
1 HP = 0.746 Watt
Load Factor = 75%
Cost of electricity = $0.179 / kWh

Existing AHU Motor Operating Cost =
{0.746 Watt/HP x Motor HP x Load Factor x Hours of Operation x Cost of Electricity] ÷ Motor Efficiency
= [0.746 x 5 x 0.75 x 4,500 x 0.179] ÷ 0.78 = $2,889 / Year

New AHU with NEMA Premium Motor Efficiency = 86.5%

New AHU with NEMA Premium Efficiency Motor Operating Cost =
{0.746 x 5 x 0.75 x 4,500 x 0.179} ÷ 0.865 = $2,605 / Year

Savings = $2,889 - $2,605 = $284 / Year

Installed Cost of a 12,600 CFM AHU with a 5 HP NEMA Premium® Efficiency Motor = $38,000
The SmartStart Building® incentive of 5hp x $60/hp is $300
Net installed Cost = $38,000 - $300 = $37,700.

Simple Payback = $37,700 / $2,605 = 14.5 Years

kWh saved = $284 / $0.179/kWh = 1,587 kWh
kW saved = 1,587 kWh / 4,500 hrs./yr. =0.35kW

**Energy Savings Summary:**

| ECM #6 - ENERGY SAVINGS SUMMARY | |
|---|---|
| **Installation Cost ($):** | $38,000 |
| **NJ Smart Start Equipment Incentive ($):** | $300 |
| **Net Installation Cost ($):** | $37,700 |
| **Maintenance Savings ($/Yr):** | $0 |
| **Energy Savings ($/Yr):** | $2,605 |
| **Total Yearly Savings ($/Yr):** | $2,605 |
| **Estimated ECM Lifetime (Yr):** | 15 |
| **Simple Payback** | 14.5 |
| **Simple Lifetime ROI** | 3.6% |
| **Simple Lifetime Maintenance Savings** | 0 |
| **Simple Lifetime Savings** | $39,075 |
| **Internal Rate of Return (IRR)** | 0% |
| **Net Present Value (NPV)** | ($6,601.68) |

## ECM #7: DDC System – Lafayette Avenue School

**Description:**

The current HVAC systems within the Lafayette Avenue School are controlled via three types of systems. The original building has pneumatic thermostats. A Johnson Controls electronic control system was installed in the 1995 addition but has since been ripped out and is now controlled manually. An Automated Logic Direct Digital Control (DDC) system is serving the 2000 and 2006 additions and is not a web based system. Thermostats are 2-stage for a day/night (occupied/unoccupied) function by means if a mechanical time clock. During initial discussions with the Owner it was noted that the hours of operation of the facility are generally 40 hours per week. Occasionally, there are additional after-hours usage during weeknights and weekends and thermostat adjustments are made by the person currently occupying the space instead on one general setpoint. This is a means for a cycling amongst different HVAC systems attempting to meet various setpoints throughout the year, independent of heating or cooling season. Therefore, a DDC system providing the Owner with full control over the HVAC equipment within the building appears to be an energy saving opportunity.

This ECM includes installing a Building Automation system with Direct Digital Controls (DDC) wired through an Ethernet backbone and front end controller within the Lafayette School only. The system will include new thermostat controllers for all indoor air-handling systems and the rooftop units, in addition to each piece of equipment being wired back to a front end controller and computer interface. With the communication between the devices and the front end computer interface, the Owner will be able to take advantage of equipment scheduling for occupied and unoccupied periods based on the actual occupancy of the facility. Due to the fact that the Lafayette School has diverse hours of occupancy, including evening and weekend hours, having supervisory control over all of the equipment makes sense. The DDC system will also aid in the response time to service / maintenance issues when the facility is not under normal maintenance supervision, i.e. after-hours.

The new DDC system has the potential to provide substantial savings by controlling the HVAC systems as a whole and provide operating schedules and features such as space averaging, night set-back, temperature override control, etc. The U.S. Department of Energy sponsored a study to analyze energy savings achieved through various types of building system controls. The referenced savings is based on the "Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways," document posted for public use April 2005. The study has found that commercial buildings have the potential to achieve significant energy savings through the use of building controls. The average energy savings are as follows based on the referenced report:

- Energy Management and Control System Savings: 5%-15%.

Savings resulting from the implementation of this ECM for energy management controls are estimated to be 10% of the total energy cost for the facility.

The cost of a full DDC system with new field devices, controllers, computer, software, programming, etc. is approximately $4.00 per SF in accordance with recent Contractor pricing for

systems of this magnitude. Savings from the implementation of this ECM will be from the reduced energy consumption currently used by the HVAC system by proper control of schedule and temperatures via the DDC system.

Cost of complete DDC System = ($4.00/SF x 75,268 SF) = $301,072

Heating Season Heating Degree Days = 4,996 HDD
Average Cost of Gas = $1.51 / Therm

Cooling Season Full Load Cooling Hrs. = 1,129 hrs / yr
Average Cost of Electricity = $0.179/ kWh

**Note:** Degree Days and Full Load Hours referenced from ASHRAE Weather Data for Newark, NJ.

**Energy Savings Calculations:**

10% Savings on Heating Calculations

$$Heat\ Load = \frac{Heat\ Loss\left(\frac{Btu}{Hr\ SF}\right) \times Area\ (SF)}{1000\left(\frac{Btu}{kBtu}\right)}$$

$$Heat\ Load = \frac{50\left(\frac{Btu}{Hr\ SF}\right) \times 75{,}268\ (SF)}{1000\left(\frac{Btu}{kBtu}\right)} = 3{,}763\left(\frac{kBtu}{Hr}\right)$$

$$Est\ Heat\ Cons. = \frac{Heat\ Load\left(\frac{kBtu}{Hr}\right) \times Heat\ Deg\ Days \times 24\ Hrs \times Correction\ Factor}{Design\ Temp\ Difference(^{\circ}F) \times Efficiency(\%) \times Fuel\ Heat\ Value\left(\frac{kBtu}{Therm}\right)}$$

$$Est\ Heat\ Cons. = \frac{3{,}763\left(\frac{kBtu}{Hr}\right) \times 4{,}996\ (HDD) \times 24\ Hrs \times 0.6}{65\ (^{\circ}F) \times 81\% \times 100\left(\frac{kBtu}{Therm}\right)} = 51{,}419(Therms)$$

$$Savings. = Heat\ Cons.(Therms) \times 10\%\ Savings \times Ave\ Gas\ Cost\left(\frac{\$}{Therm}\right)$$

$$Savings. = 51{,}419\,(Therms) \times 10\% \times 1.51\left(\frac{\$}{Therm}\right) = \underline{\$7{,}764}$$

10% Savings on Cooling Calculations**:**

$$Est\ Cool\ Cons. = \frac{Cool\ Load\,(Tons) \times 12{,}000\left(\frac{Btu}{Ton\ Hr}\right) \times Full\ Load\ Cooling\ Hrs.}{Ave\ Energy\ Efficiency\ Ratio\left(\frac{Btu}{Wh}\right) \times 1000\left(\frac{Wh}{kWh}\right)}$$

$$Est\ Cool\ Cons. = \frac{177\,(Tons) \times 12{,}000\left(\frac{Btu}{Ton\ Hr}\right) \times 1{,}129\ Hrs.}{10.3\left(\frac{Btu}{Wh}\right) \times 1000\left(\frac{Wh}{kWh}\right)} = 232{,}815(kWh)$$

$$Savings. = Cool\ Cons.(kWh) \times 10\%\ Savings \times Ave\ Elec\ Cost\left(\frac{\$}{kWh}\right)$$

$$Savings. = 232{,}815\,(kWh) \times 10\% \times 0.179\left(\frac{\$}{kWh}\right) = \underline{\$4{,}167}$$

Total Annual Energy Savings = $7,764 + $4,167 = $11,931 per year

It is pertinent to note that electric demand savings were unable to be estimated. Also, incentives for the installation of the DDC system are not currently available and maintenance savings could not be adequately calculated because information was not available to baseline the savings.

**Estimated Maintenance Savings:**

As stated before, a Johnson Controls electronic control system was installed in the 1995 addition but has since been ripped out and is now controlled manually. This ECM would eliminate the need to manually control this equipment and the savings is estimated as follows:

Maintenance Savings = 0.5 hrs/day x 5 days/week x 52 weeks/year x $20/hour = $2,600

**Energy Savings Summary:**

| ECM #7 - ENERGY SAVINGS SUMMARY | |
|---|---|
| **Installation Cost ($):** | $301,072 |
| **NJ Smart Start Equipment Incentive ($):** | $0 |
| **Net Installation Cost ($):** | $301,072 |
| **Maintenance Savings ($/Yr):** | $2,600 |
| **Energy Savings ($/Yr):** | $11,931 |
| **Total Yearly Savings ($/Yr):** | $14,531 |
| **Estimated ECM Lifetime (Yr):** | 15 |
| **Simple Payback** | 20.7 |
| **Simple Lifetime ROI** | -27.6% |
| **Simple Lifetime Maintenance Savings** | $39,000 |
| **Simple Lifetime Savings** | $217,965 |
| **Internal Rate of Return (IRR)** | -4% |
| **Net Present Value (NPV)** | ($127,601.87) |

# VIII. RENEWABLE/DISTRIBUTED ENERGY MEASURES

Globally, renewable energy has become a priority affecting international and domestic energy policy. The State of New Jersey has taken a proactive approach, and has recently adopted in its Energy Master Plan a goal of 30% renewable energy by 2020. To help reach this goal New Jersey created the Office of Clean Energy under the direction of the Board of Public Utilities and instituted a Renewable Energy Incentive Program to provide additional funding to private and public entities for installing qualified renewable technologies. A renewable energy source can greatly reduce a building's operating expenses while producing clean environmentally friendly energy. CEG has assessed the feasibility of installing renewable energy measures (REM) for the municipality utilizing renewable technologies and concluded that there is potential for solar energy generation. The solar photovoltaic system calculation summary will be concluded as **REM#1** within this report.

Solar energy produces clean energy and reduces a building's carbon footprint. This is accomplished via photovoltaic panels which will be mounted on all south and southwestern facades of the building. Flat roof, as well as sloped areas can be utilized; flat areas will have the panels turned to an optimum solar absorbing angle. (A structural survey of the roof would be necessary before the installation of PV panels is considered). The state of NJ has instituted a program in which one Solar Renewable Energy Certificate (SREC) is given to the Owner for every 1000 kWh of generation. SREC's can be sold anytime on the market at their current market value. The value of the credit varies upon the current need of the power companies. The average value per credit is around $350, this value was used in our financial calculations. This equates to $0.35 per kWh generated.

CEG has reviewed the existing roof area of the building being audited for the purposes of determining a potential for a roof mounted photovoltaic system. A roof area of 6,426 S.F. can be utilized for a PV system. A depiction of the area utilized is shown in Renewable / Distributed Energy Measures Calculation appendix. Using this square footage it was determined that a system size of 100.51 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 125,300 KWh annually, reducing the overall utility bill by approximately 20.6% percent. A detailed financial analysis can be found in the Renewable / Distributed Energy Measures Calculation appendix. This analysis illustrates the payback of the system over a 25 year period. The eventual degradation of the solar panels and the price of accumulated SREC's are factored into the payback.

The proposed photovoltaic array layout is designed based on the specifications for the Sun Power SPR-230 panel. This panel has a "DC" rated full load output of 230 watts, and has a total panel conversion efficiency of 18%. Although panels rated at higher wattages are available through Sun Power and other various manufacturers, in general most manufacturers who produce commercially available solar panels produce a similar panel in the 200 to 250 watt range. This provides more manufacturer options to the public entity if they wish to pursue the proposed solar recommendation without losing significant system capacity.

The array system capacity was sized on available roof space on the existing facility. Estimated solar array generation was then calculated based on the National Renewable Energy Laboratory PVWatts Version 1.0 Calculator. In order to calculate the array generation an appropriate location with solar data on file must be selected. In addition the system DC rated kilowatt (kW) capacity must be inputted, a DC to AC de-rate factor, panel tilt angle, and array azimuth angle. The DC to AC de-

rate factor is based on the panel nameplate DC rating, inverter and transformer efficiencies (95%), mismatch factor (98%), diodes and connections (100%), dc and ac wiring(98%, 99%), soiling, (95%), system availability (95%), shading (if applicable), and age(new/100%). The overall DC to AC de-rate factor has been calculated at an overall rating of 81%. The PVWatts Calculator program then calculates estimated system generation based on average monthly solar irradiance and user provided inputs. The monthly energy generation and offset electric costs from the PVWatts calculator is shown in the **Renewable/Distributed Energy Measures Calculation Appendix**.

The proposed solar array is qualified by the New Jersey Board of Public Utilities Net Metering Guidelines as a Class I Renewable Energy Source. These guidelines allow onsite customer generation using renewable energy sources such as solar and wind with a capacity of 2 megawatts (MW) or less. This limits a customer system design capacity to being a net user and not a net generator of electricity on an annual basis. Although these guidelines state that if a customer does net generate (produce more electricity than they use), the customer will be credited those kilowatt-hours generated to be carried over for future usage on a month to month basis. Then, on an annual basis if the customer is a net generator the customer will then be compensated by the utility the average annual PJM Grid LMP price per kilowatt-hour for the over generation. Due to the aforementioned legislation, the customer is at limited risk if they generate more than they use at times throughout the year. With the inefficiency of today's energy storage systems, such as batteries, the added cost of storage systems is not warranted and was not considered in the proposed design.

CEG has reviewed financing options for the owner. Two options were studied and they are as follows: Self-financed and direct purchase without finance. Self-finance was calculated with 95% of the total project cost financed at a 7% interest rate over 25 years. Direct purchase involves the local government paying for 100% of the total project cost upfront via one of the methods noted in the Installation Funding Options section below. Both of these calculations include a utility inflation rate as well as the degradation of the solar panels over time. Based on our calculations the following are the payback periods for the respective method of payment:

| FINANCIAL SUMMARY - PHOTOVOLTAIC SYSTEM | | | |
|---|---|---|---|
| **PAYMENT TYPE** | **SIMPLE PAYBACK** | **SIMPLE ROI** | **INTERNAL RATE OF RETURN** |
| Self-Finance | 13.7 Years | 83.2% | 1.1% |
| Direct Purchase | 13.7 Years | 83.2% | 6.0% |

*The solar energy measure is shown for reference in the executive summary REM table

The resultant Internal Rate of Return indicates that if the Owner was able to "Direct Purchase" the solar project, the project would be slightly more beneficial to the Owner.

In addition to the Solar Analysis, CEG also conducted a review of the applicability of wind energy for the facility. Wind energy production is another option available through the Renewable Energy Incentive Program. Wind turbines of various types can be utilized to produce clean energy on a per building basis. Cash incentives are available per kWh of electric usage. Based on CEG's review of the applicability of wind energy for the facility, it was determined that the average wind speed is not adequate for purchase of a commercial wind turbine. Therefore, wind energy is not a viable option to implement.

# IX. ENERGY PURCHASING AND PROCUREMENT STRATEGY

**Load Profile:**
Load Profile analysis was performed to determine the seasonal energy usage of the facility. Irregularities in the load profile will indicate potential problems within the facility. Consequently based on the profile a recommendation will be made to remedy the irregularity in energy usage. For this report, the facility's energy consumption data was gathered in table format and plotted in graph form to create the load profile. Refer to the Electric and Natural Gas Usage Profiles included within this report to reference the respective electricity and natural gas usage load profiles.

Electricity:

The Electric Usage Profile demonstrates a fairly flat load profile throughout the year. This is a unusual for a school, because typically schools are closed in the summer. However the steady and elevated summer load profile (March – July), with a peak in May is supported by summer school, the boiler rooms, kitchen, cafeteria, offices, classrooms, gymnasium, locker rooms, restrooms, media center, general music, art room and tech labs. The auditorium is in use throughout the year. A steady load throughout the summer is a sign of consistent cooling load (air-conditioning). Air-conditioning in this facility is provided by (32) thirty two split system air-conditioning units, (5) five window units and (7) seven, roof-top units. Lighting in the Lafayette School is primarily made up of T-12 lamps. These lamps use more energy than energy-efficient lamps recommended today. A flatter load profile of this type, will allow for more competitive energy prices when shopping for alternative energy suppliers.

Natural Gas:

The Natural Gas Usage Profile demonstrates a very typical heating load profile. An increase in consumption is observed October through March during the standard heating season. Heating for this facility is provided by (2) two boiler plants providing hot water for heating and the presence of roof-top air handling units that also provide heat. The boiler plant consists of (2) two natural gas fired water boilers. These boilers provided hot water to unit heaters, unit ventilators, convectors, heat and ventilator units and radiant floor panels. The 2001 addition also has a boiler for this addition. Domestic hot water is provided by an A.O Smith natural gas fired hot water heater. The addition has its own smaller A.A. Smith natural gas fired hot water heater. Natural gas Delivery-service is provided by Public Service Electric and Gas Company (PSE&G) on an LVG rate schedule. Commodity service is supplied by the Hess Corporation, the Third Party Supplier. This consistent load profile is beneficial when looking at supply options with new Third Party Suppliers.

**Tariff:**

Electricity:

This facility receives electrical service through Jersey Central Power & Light (JCP&L) on a GSS (General Service Secondary – 3 Phase) rate. Service classification GS is available for general service purposes on secondary voltages not included under Service Classifications RS, RT, RGT or GST. This facility's rate is a three phase service at secondary voltages. For electric supply (generation), the customer uses the service of a JCP&L. This facility uses the Delivery Service of

the utility (JCP&L). The Delivery Service includes the following charges: Customer Charge, Supplemental Customer Charge, Distribution Charge (kW Demand), kWh Charge, Non-utility Generation Charge, TEFA, SBC, SCC, Standby Fee and RGGI. The Generation Service is provided by JCP&L under BGS (Basic Generation Service). BGS Energy and Reconciliation Charges are provided in Rider BGS-FP (fixed pricing) or BGS-CIEP (Commercial Industrial Energy Pricing). BGS also has a Transmission component to its charge.

Natural Gas:

This facility receives utility service through Public Service Electric and Gas Company (PSE&G). This facility utilizes the Delivery Service from PSE&G while receiving Commodity service from a Third Party Supplier (TPS), Hess Corporation.

LVG Rate: This utility tariff is for "firm" delivery service for general purposes. This rate schedule has a Delivery Charge, Balancing Charge, Societal Benefits Charge, Realignment Adjustment Charge, Margin Adjustment Charge, RGGI Charge and Customer Account Service Charge. The customer can elect to have the Commodity Charge serviced through the utility or by a Third Party Supplier (TPS). Note: Should the TPS not deliver, the customer may receive service from PSE&G under Emergency Sales Service. Emergency Sales Service carries an extremely high penalty cost of service.

"Firm" delivery service defines the reliability of the transportation segment of the pricing. Much like the telecom industry, natural gas pipelines were un-bundled in the late 1990's and the space was divided up and marketed into reliability of service. Firm Service is said to be the most reliable and last in the pecking order for interruption. This service should not be interrupted.

Commodity Charges: Customer may choose to receive gas supply from either: A TPS or PSE&G through its Basic Gas Supply Service default service. PSE&G may also supply Emergency Sales Service in certain instances. This is at a much higher than normal rate. It should be perceived as a penalty.

This facility utilizes the services of a Third Party Supplier, The Hess Corporation. The contract is administered by The Alliance for Competitive Service (ACES). ACES is the energy aggregation program of the New Jersey School Boards Association of School Administrator's. The process was reviewed and approved by the New Jersey Department of Community Affairs.

Please see CEG recommendations below.

**Recommendations:**

CEG recommends a global approach that will be consistent with all facilities. Good potential savings can be seen equally in the electric costs and the natural gas costs. The average price per kWh (kilowatt hour) for the High School based on a historical 1-year weighted average fixed price from the utility JCP&L is $.1415 / kWh (this is the fixed "price to compare" when shopping for energy procurement alternatives). The fixed weighted average price per decatherm for natural gas service in the High School, provided by the Hess Corporation (TPS) is $ 12.08 / dth (dth, is the common unit of measure). The natural gas prices are also the "prices to compare".

The "price to compare" is the netted cost of the energy (including other costs), that the customer will use to compare to Third Party Supply sources when shopping for alternative suppliers. For electricity this cost would not include the utility transmission and distribution chargers. For natural gas the cost would not include the utility distribution charges and is said to be delivered to the utilities city-gate.

Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. Chatham School District could see improvement in its energy costs if it were to take advantage of these current market prices quickly, before energy prices increase. Based on electric supply from JCP&L and utilizing the historical consumption data provided (August 2008 through July 2009) and current electric rates, the school(s) could see an improvement in its electric costs of up to 25 % annually. (Note: Savings were calculated using Average Annual Consumption and a variance to a Fixed Average One-Year commodity contract). CEG recommends aggregating the entire electric load to gain the most optimal energy costs. CEG recommends advisement for alternative sourcing and supply of energy on a "managed approach".

CEG's second recommendation coincides with the natural gas costs. Based on the current alternative market pricing supplied by the Hess Corporation (ACES Agreement), CEG feels that School District could see an improvement of up to 33 % in its natural gas costs. CEG has experience with the mechanism for schools to buy energy in New Jersey. It is through the ACES Agreement (The Alliance for Competitive Energy Services) which is an energy aggregation program. From our experience, the basis price is the reason that the overall average price per dekatherm is ($12.08/dth). Therefore the average pricing formula supplied by Hess is 25 % above today's competitive market pricing. CEG recommends the school receive further advisement on these prices through an energy advisor. They should also consider procuring energy (natural gas) through an alternative supply source.

CEG also recommends scheduling a meeting with the current utility providers to review their utility charges and current tariff structures for electricity and natural gas. This meeting would provide insight regarding alternative procurement options that are currently available. Through its meeting with the Local Distribution Company (LDC), the municipality can learn more about the competitive supply process. The county can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu. They should also consider using a billing-auditing service to further analyze the utility invoices, manage the data and use the information for ongoing demand-side management projects. Furthermore, special attention should be given to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with the utility representative. The School District should ask the utility representative about alternative billing options, such as consolidated billing when utilizing the service of a Third Party Supplier. Finally, if the supplier for energy (natural gas) is changed, closely monitor balancing, particularly when the contract is close to termination. This could be performed with the aid of an "energy advisor".

# X. INSTALLATION FUNDING OPTIONS

CEG has reviewed various funding options for the Owner to utilize in subsidizing the costs for installing the energy conservation measures noted within this report. Below are a few alternative funding methods:

i. *Energy Savings Improvement Program (ESIP)* – Public Law 2009, Chapter 4 authorizes government entities to make energy related improvements to their facilities and par for the costs using the value of energy savings that result from the improvements. The "Energy Savings Improvement Program (ESIP)" law provides a flexible approach that can allow all government agencies in New Jersey to improve and reduce energy usage with minimal expenditure of new financial resources.

ii. *Municipal Bonds* – Municipal bonds are a bond issued by a city or other local government, or their agencies. Potential issuers of municipal bonds include cities, counties, redevelopment agencies, school districts, publicly owned airports and seaports, and any other governmental entity (or group of governments) below the state level. Municipal bonds may be general obligations of the issuer or secured by specified revenues. Interest income received by holders of municipal bonds is often exempt from the federal income tax and from the income tax of the state in which they are issued, although municipal bonds issued for certain purposes may not be tax exempt.

iii. *Power Purchase Agreement* – Public Law 2008, Chapter 3 authorizes contractor of up to fifteen (15) years for contracts commonly known as "power purchase agreements." These are programs where the contracting unit (Owner) procures a contract for, in most cases, a third party to install, maintain, and own a renewable energy system. These renewable energy systems are typically solar panels, windmills or other systems that create renewable energy. In exchange for the third party's work of installing, maintaining and owning the renewable energy system, the contracting unit (Owner) agrees to purchase the power generated by the renewable energy system from the third party at agreed upon energy rates.

iv. *Pay For Performance* – The New Jersey Smart Start Pay for Performance program includes incentives based on savings resulted from implemented ECMs. The program is available for all buildings with average demand loads above 200 KW. The facility's participation in the program is assisted by an approved program partner. An "Energy Reduction Plan" is created with the facility and approved partner to shown at least 15% reduction in the building's current energy use. Multiple energy conservation measures implemented together are applicable toward the total savings of at least 15%. No more than 50% of the total energy savings can result from lighting upgrades / changes.

Total incentive is capped at 50% of the project cost. The program savings is broken down into three benchmarks; Energy Reduction Plan, Project Implementation, and Measurement and Verification. Each step provides additional incentives as the energy reduction project continues. The benchmark incentives are as follows:

1. Energy Reduction Plan – Upon completion of an energy reduction plan by an approved program partner, the incentive will grant $0.10 per square foot between $5,000 and $50,000, and not to exceed 50% of the facility's annual energy expense. (Benchmark #1 is not provided in addition to the local government energy audit program incentive.)

2. Project Implementation – Upon installation of the recommended measures along with the "Substantial Completion Construction Report," the incentive will grant savings per KWH or Therm based on the program's rates. Minimum saving must be 15%. (Example $0.11 / kWh for 15% savings, $0.12/ kWh for 17% savings, … and $1.10 / Therm for 15% savings, $1.20 / Therm for 17% saving, …) Increased incentives result from projected savings above 15%.

3. Measurement and Verification – Upon verification 12 months after implementation of all recommended measures, that actual savings have been achieved, based on a completed verification report, the incentive will grant additional savings per kWh or Therm based on the program's rates. Minimum savings must be 15%. (Example $0.07 / kWh for 15% savings, $0.08/ kWh for 17% savings, … and $0.70 / Therm for 15% savings, $0.80 / Therm for 17% saving, …) Increased incentives result from verified savings above 15%.

CEG recommends the Owner review the use of the above-listed funding options in addition to utilizing their standard method of financing for facilities upgrades in order to fund the proposed energy conservation measures.

# XI. ADDITIONAL RECOMMENDATIONS

The following recommendations include no cost/low cost measures, Operation & Maintenance (O&M) items, and water conservation measures with attractive paybacks. These measures are not eligible for the Smart Start Buildings incentives from the office of Clean Energy but save energy none the less.

A. Chemically clean the condenser and evaporator coils in the window AC units periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%. The 3-step process includes cleaning of the coils, rinsing and a micro biocide treatment. Thoroughly cleaned coils are not as susceptible to re-fouling so they stay clean longer, reducing the cleaning cycle frequency

B. Maintain all weather stripping on windows and doors.

C. Repair/replace damaged or missing ductwork insulation in the ceiling spaces.

D. Provide more frequent air filter changes to decrease overall fan horsepower requirements and maintain better IAQ.

E. Recalibrate existing zone thermostats.

F. Clean all fixtures to maximize light output.

G. Feel for air drafts around electrical outlets. Inexpensive pads are available, as are plugs for unused sockets.

# ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

**Lafayette Avenue School**

| ECM NO. | DESCRIPTION | INSTALLATION COST | | | | YEARLY SAVINGS | | | ECM LIFETIME | LIFETIME ENERGY SAVINGS | LIFETIME MAINTENANCE SAVINGS | LIFETIME ROI | SIMPLE PAYBACK | INTERNAL RATE OF RETURN (IRR) | NET PRESENT VALUE (NPV) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MATERIAL | LABOR | REBATES, INCENTIVES | NET INSTALLATION COST | ENERGY | MAINT. | TOTAL | | (Yearly Saving * ECM Lifetime) | (Yearly Maint Svaing * ECM Lifetime) | (Lifetime Savings - Net Cost) / (Net Cost) | (Net cost / Yearly Savings) | $\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$ | $\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$ |
| | | ($) | ($) | ($) | ($) | ($/Yr) | ($/Yr) | ($/Yr) | (Yr) | ($) | ($) | (%) | (Yr) | ($) | ($) |
| **ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY** | | | | | | | | | | | | | | | |
| ECM #1 | Lighting Upgrade - General | $13,218 | $0 | $0 | $13,218 | $2,887 | $0 | $2,887 | 25 | $72,186 | $12 | 446.1% | 4.6 | 21.68% | $37,061.61 |
| ECM #2 | Lighting Controls | $11,680 | $0 | $1,460 | $10,220 | $2,718 | $0 | $2,718 | 15 | $40,770 | $0 | 298.9% | 3.8 | 25.74% | $22,227.31 |
| ECM #3 | Lighting Upgrade - Gym | $5,400 | $0 | $900 | $4,500 | $737 | $68 | $805 | 25 | $20,130 | $1,700 | 347.3% | 5.6 | 17.58% | $9,520.89 |
| ECM #4 | Boiler Replacement – High Efficiency Upgrade | $294,500 | $0 | $0 | $294,500 | $8,430 | $0 | $8,430 | 35 | $295,050 | $0 | 0.2% | 34.9 | 0.01% | ($113,362.73) |
| ECM #5 | Domestic Water Heater Replacement | $15,340 | $0 | $648 | $14,692 | $451 | $0 | $451 | 12 | $5,412 | $0 | -63.2% | 32.6 | -12.79% | ($10,202.74) |
| ECM #6 | Indoor Air handling Unit Replacement | $38,000 | $0 | $300 | $37,700 | $2,605 | $0 | $2,605 | 15 | $39,075 | $0 | 3.6% | 14.5 | 0.45% | ($6,601.68) |
| ECM #7 | DDC System – Lafayette Avenue School | $301,072 | $0 | $0 | $301,072 | $11,931 | $2,600 | $14,531 | 15 | $217,965 | $39,000 | -27.6% | 20.7 | -3.79% | ($127,601.87) |
| **REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY** | | | | | | | | | | | | | | | |
| REM #1 | Solar PV Project | $904,590 | $0 | $0 | $904,590 | $22,429 | $43,855 | $66,284 | 25 | $1,657,100 | $1,096,375 | 83.2% | 13.6 | 5.32% | $249,623.08 |

**Notes:** 1) The variable Cn in the formulas for Internal Rate of Return and Net Present Value stands for the cash flow during each period.
2) The variable DR in the NPV equation stands for Discount Rate
3) For NPV and IRR calculations: From n=0 to N periods where N is the *lifetime of ECM* and Cn is the *cash flow during each period* .

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## SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of January, 2009:

### Electric Chillers

| | |
|---|---|
| Water-Cooled Chillers | $12 - $170 per ton |
| Air-Cooled Chillers | $8 - $52 per ton |

### Gas Cooling

| | |
|---|---|
| Gas Absorption Chillers | $185 - $400 per ton |
| Gas Engine-Driven Chillers | Calculated through custom measure path) |

### Desiccant Systems

| |
|---|
| $1.00 per cfm – gas or electric |

### Electric Unitary HVAC

| | |
|---|---|
| Unitary AC and Split Systems | $73 - $93 per ton |
| Air-to-Air Heat Pumps | $73 - $92 per ton |
| Water-Source Heat Pumps | $81 per ton |
| Packaged Terminal AC & HP | $65 per ton |
| Central DX AC Systems | $40- $72 per ton |
| Dual Enthalpy Economizer Controls | $250 |

### Ground Source Heat Pumps

| | |
|---|---|
| Closed Loop & Open Loop | $370 per ton |

### Gas Heating

| | |
|---|---|
| Gas Fired Boilers < 300 MBH | $300 per unit |
| Gas Fired Boilers ≥ 300 - 1500 MBH | $1.75 per MBH |
| Gas Fired Boilers ≥1500 - ≤ 4000 MBH | $1.00 per MBH |
| Gas Fired Boilers > 4000 MBH | (Calculated through Custom Measure Path) |
| Gas Furnaces | $300 - $400 per unit |

## Variable Frequency Drives

| | |
|---|---|
| Variable Air Volume | $65 - $155 per hp |
| Chilled-Water Pumps | $60 per hp |
| Compressors | $5,250 to $12,500 per drive |

## Natural Gas Water Heating

| | |
|---|---|
| Gas Water Heaters ≤ 50 gallons | $50 per unit |
| Gas-Fired Water Heaters >50 gallons | $1.00 - $2.00 per MBH |
| Gas-Fired Booster Water Heaters | $17 - $35 per MBH |

## Premium Motors

| | |
|---|---|
| Three-Phase Motors | $45 - $700 per motor |

## Prescriptive Lighting

| | |
|---|---|
| T-5 and T-8 Lamps w/Electronic Ballast in Existing Facilities | $10 - $30 per fixture, (depending on quantity) |
| Hard-Wired Compact Fluorescent | $25 - $30 per fixture |
| Metal Halide w/Pulse Start | $25 per fixture |
| LED Exit Signs | $10 - $20 per fixture |
| T-5 and T-8 High Bay Fixtures | $16 - $284 per fixture |

## Lighting Controls – Occupancy Sensors

| | |
|---|---|
| Wall Mounted | $20 per control |
| Remote Mounted | $35 per control |
| Daylight Dimmers | $25 per fixture |
| Occupancy Controlled hi-low Fluorescent Controls | $25 per fixture controlled |

## Lighting Controls – HID or Fluorescent Hi-Bay Controls

| | |
|---|---|
| Occupancy hi-low | $75 per fixture controlled |
| Daylight Dimming | $75 per fixture controlled |

## Other Equipment Incentives

| | |
|---|---|
| Performance Lighting | $1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1-2004 for New Construction and Complete Renovation |
| Custom Electric and Gas Equipment Incentives | not prescriptive |

# MAJOR EQUIPMENT LIST

**Concord Engineering Group**

**Lafayette Avenue School**

## Boiler

| Location | Area Served | Manufacturer | Qty. | Model # | Serial # | Input (MBh) | Output (MBh) | Efficiency (%) | Fuel | Approx. Age | ASHRAE Service Life | Remaining Life | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Boiler Room 1 (B1) | Original Bldg | Cyclotherm | 1 | 3500W-W4-SP | 7481 | 4190 | 3350 | 80% | NG | 1953 | 35 | (-21) | |
| Boiler Room 1 (B2) | Original Bldg | Cyclotherm | 1 | 3500W-W4-SP | 7480 | 4190 | 3350 | 80% | NG | 1953 | 35 | (-21) | |
| Boiler Room 2 (B3) | 2001 Addition | Smith | 1 | 28A-8 | N2001-810 | 2499 | 1709 | 68 | NG | 2001 | 35 | 27 | |

## Boiler - Burner

| Location | Area Served | Manufacturer | Qty. | Model # | Serial # | Input (MBh) | Efficiency (%) | Fuel | Approx. Age | ASHRAE Service Life | Remaining Life | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Boiler Room 1 | Original Bldg | Industrial Combustion | 2 | HG-25-S-1 | 40542-1 | 2500 | 80 | NG | 2001 | 21 | 13 | |
| Boiler Room 2 | 2001 Addition | Industrial Combustion | 1 | AM 4-3/4 CM | G 8946 | 4190 | 80 | NG | | | | |

## Pumps

| Location | Area Served | Manufacturer | Qty. | Model # | Serial # | HP | RPM | GPM | Ft. Hd | Frame Size | Volts | Phase | Approx. Age | ASHRAE Service Life | Remaining Life | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Boiler Room 2 | Smith Boiler loop | Baldor Motor | 2 | HU1507AE2HCB719M | | 2 | 1750 | 46 | 51 | | | | 2007 | 10 | 8 | |
| Boiler Room 2 | Smith Boiler loop | Armstrong | 2 | 2x2x6 A380 | 43382 | 5 | 3600 | 100 | 72 | | | | 2007 | 10 | 8 | |
| Boiler Room 2 | Smith Boiler loop | B&G | 1 | 189162 E40 | | fractional | | | | | | | 2004 | 10 | 5 | |
| Boiler Room 1 | Original Bldg. | B&G | 2 | 1510-21/288 | | 7.5 | 1760 | 250 | 55 | L213T | | | | 20 | | 90.2 %EFF |
| Boiler Room 1 | Dom. Circ Pump | Circ Pump | 1 | HU BNF1 | E60 102213 | | | | | | | | 2006 | 10 | 7 | |
| Boiler Room 1 | Dom. Circ Pump | B&G | 1 | Series 100 AB | F08 106192 | | | | | | | | | 10 | | |
| Boiler Room 1 | Circ Pump | B&G | 1 | | P/N M80121 | 1/3 | 1725 | | | | 115/230 | 1 | | 10 | | |

## Domestic Hot Water Heater

| Location | Area Served | Manufacturer | Qty | Model # | Serial # | Input (MBh) | Recovery (gal/h) | Capacity (gal) | Efficiency (%) | Fuel | Approx. Age | ASHRAE Service Life | Remaining Life | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Boiler Room 2 | | Smith | 1 | BTR 120 110 | MD011025 463 | 120 | 116.4 | 71 | | NG | 1992 | 12 | (-5) | |
| Boiler Room 1 | | Smith | 1 | HW 200M 942 | 942 B 98 43192 | 199 | 181 | | | NG | 1998 | 12 | 1 | |

## Air Handling Units

| Location | Area Served | Manufacturer | Qty | Model # | Serial # | Cooling Coil | Cooling Eff. (EER) | Cooling Capacity (Tons) | Heating Type | Input (MBh) | Output (MBh) | Heating Eff. (%) | Fuel | Volts | Phase | Amps | Approx. Age | ASHRAE Service Life | Remaining Life | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rooftop | | Nesbitt | 1 | RMF100NG317BH3BB01A4501B0DD31 | N0912011001 | R-22 | | | HTX | 285 | 228 | 80% | NG | 208 | 3 | 5 | 8 | 15 | 7 | |
| Rooftop | | Carrier Weather Master | 1 | 48HJD006---531HE | 1301G24542 | R-22 | | | HTX | 50/72 | 41/59 | 82% | NG | 208/230 | 3 | | 8 | 15 | 7 | |
| Rooftop (RTU-1) | Media Center | AAON | 1 | RM-025-8-0-BA02-369 | 200612-AMGR29908 | R-410A | 10.8 | 25 | HTX | 390 | 316 | 81% | NG | 208 | 3 | | 3 | 15 | 12 | |
| Rooftop (RTU-2) | 2006 Cooridoor & Restrooms | AAON | 1 | RM-A05-8-0-BB01-339 | 200612-AMGE29896 | R-410A | 13.4 | 5 | HTX | 180 | 146 | 81% | NG | 208 | 3 | | 3 | 15 | 12 | |
| Rooftop (RTU-3) | 2006 Conf Rm | AAON | 1 | RM-A02-1-0-BA01-319 | 200612-AMGB29897 | R-410A | 13.8 | 2 | HTX | 69 | 56 | 81% | NG | 230 | 1 | | 3 | 15 | 12 | |
| Rooftop (RTU-4) | | AAON | 1 | RM-A02-1-0-BA01-319 | 200612-AMGB29898 | R-410A | 13.8 | 2 | HTX | 69 | 56 | 81% | NG | 230 | 1 | | 3 | 15 | 12 | |
| Rooftop (RTU-5) | Art Rm | AAON | 1 | RM-008-8-0-BB02-339 | 200611-AMGH29881 | R-410A | 12.7 | 8 | HTX | 180 | 146 | 81% | NG | 208 | 3 | | 3 | 15 | 12 | |
| Boiler Room 1 | | Herman Nelson | 1 | SB-3180 | 510 967 | | | | HW | | | | | | | | | | | Elliot Company PE-21103007 |
| Boiler Room 1 | | Air C. Quincy Climate Control | 1 | Q020BBD00004 | 5162730 | | | | HW | | | | | | | | | | | |

## Split Systems and AC Condensers

| Location | Area Served | Manufacturer | Qty. | Model # | Serial # | Cooling Capacity (Btu/h) | Eff. | Refrigerant | Volts | Phase | Amps | Approx. Age | ASHRAE Service Life | Remaining Life | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rooftop | | Lennox | 1 | HS29-042-13Y | 5807B44260 | 42000 | 13 | R-22 | 208/230 | 3 | | 2007 | 15 | 13 | |
| Rooftop | | Heat Controller | 1 | A-HMC18AS | | 18000/17800 | | R-22 | 230/208 | 1 | | | 15 | | |
| Rooftop | | Fedders | 1 | C1036BBD3V | FS350727 | 36,000 | | R-22 | | | | | 15 | | |
| Ground | | EMI | 1 | SHD12AAA000AA0A | 1-96-J-3240-38 | 12000 | | R-22 | 115 | 1 | | 1996 | 15 | 2 | |
| Classrooms | | Friedrich Quietmaster | 4 | KM18L30-C | LHHZ00186 | 17800/17600 | | R-22 | 230/208 | 1 | 8.1/10 | | 10 | | |
| Classrooms | | Fedders | 4 | ASL14E2J | FZ611051 1818 | 14000 | | | 115 | 1 | 12 | | 15 | | |
| Classrooms | | Carrier | 2 | 51CMC112101 | 43 822364 | 12000 | 9.2 | | 115 | 1 | 12 | | 15 | | |
| Rooftop | | Trane | 2 | TTP018C100A2 | L1044BPBF | 18000 | | R-22 | 200/230 | 1 | | Mar-96 | 15 | 2 | |
| Rooftop | | Trane | 7 | TTA048C300A0 | L215RB4BF, L215RE4BF, L215SEUBF, L215P5PBF, L215SJNBF, L215SSKBF, L215RA5BF | 48,000 | | R-22 | 200/230 | 3 | | May-95 | 15 | 1 | |
| Rooftop | | Trane | 1 | TTA048C300A1 | N1714SEBF | 48,000 | | R-22 | 200/230 | 3 | | | 15 | | |
| Rooftop | | Trane | 2 | TTA060C300A0 | L182TF8FF, L182TU4FF | 60,000 | | R-22 | 200/230 | 3 | | Apr-96 | 15 | 2 | |
| Rooftop | | EMI | 1 | S1CA9000A00 | 1-06-R-6746-43 | 9,000 | | R-22 | 115 | 1 | | Jun-05 | 15 | 11 | |
| Rooftop | | Old Condensing Unit | 2 | Could not read tag | | | | | | | | | 15 | | |
| Rooftop | | Trane | 3 | TTA048C300A0 | L215R B4BF | 48,000 | | R-22 | 200/230 | 3 | | May-96 | 15 | 2 | |

## Window AC Units

| Location | Area Served | Manufacturer | Qty. | Model # | Serial # | Cooling Capacity - DX | Heating Capacity - | Fan HP | Volts | Phase | Amps | Approx. Age | ASHRAE Service | Remaining Life | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Classrooms 10, 11, 13, 14 | Classrooms 10, 11, 13, 14 | Friedrich Quietmaster | 4 | KS15L10-A | LEAR 13550 | 14500 | | | 115 | 1 | 12.2 | 2005 | 15 | 11 | 10.8 EER |
| Classrooms | Classroom 12 | Fedders | 1 | A3L14E2A | MA664597 3399 | 14000 | | | 115 | 1 | | | | | |
| | | | | | | | | | | | | | | | |

## Air Compressor

| Location | Area Served | Manufacturer | Qty. | Model # | Serial # | HP | Pressure | Capacity | Volts | Phase | FLA | Approx. Age | ASHRAE Service Life | Remaining Life | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Boiler Room 1 | Original Building | Quincy | 1 | Q020BBD00004 | 5162730 | (2) 2 | | | | | | | 20 | | Fairly new but Pneumatic controls are orig/past life |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

## Classroom Unit Ventilator

| Location | Area Served | Manufacturer | Qty. | Model # | Serial # | Cooling Capacity - DX | Heating Capacity - HW | Fan HP | Volts | Phase | Amps | Approx. Age | ASHRAE Service Life | Remaining Life | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rm 29-33, SG1 | Classroom | Airedale Classmate | 6 | CMX4-208 | S32150030315510 6-1475 | 47000 TC / 35.25 SC | 74 MBH , 3 gpm | 1 | 208 | 3 | | 2006 | 15 | 12 | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

OMB No. 2060-0347

# STATEMENT OF ENERGY PERFORMANCE
# Lafayette Avenue School

**Building ID:** 1830623
**For 12-month Period Ending:** July 31, 2009[1]
**Date SEP becomes ineligible:** N/A
**Date SEP Generated:** October 06, 2009

**Facility**
Lafayette Avenue School
221 Lafayette Ave
Chatham, NJ 07928

**Facility Owner**
School District of the Chathams
58 Meyersville Road
Chatham, NJ 07928

**Primary Contact for this Facility**
Ralph Goodwin
58 Meyersville Road
Chatham, NJ 07928

**Year Built:** 1954
**Gross Floor Area (ft²):** 75,268

**Energy Performance Rating**[2] (1-100) 25

**Site Energy Use Summary**[3]

| | |
|---|---|
| Electricity - Grid Purchase(kBtu) | 2,073,251 |
| Natural Gas (kBtu)[4] | 6,481,087 |
| Total Energy (kBtu) | 8,554,338 |

**Energy Intensity**[5]

| | |
|---|---|
| Site (kBtu/ft²/yr) | 114 |
| Source (kBtu/ft²/yr) | 182 |

**Emissions** (based on site energy use)

| | |
|---|---|
| Greenhouse Gas Emissions ($MtCO_2e$/year) | 661 |

**Electric Distribution Utility**
Jersey Central Power & Lt Co

**National Average Comparison**

| | |
|---|---|
| National Average Site EUI | 90 |
| National Average Source EUI | 145 |
| % Difference from National Average Source EUI | 26% |
| Building Type | K-12 School |

Stamp of Certifying Professional

Based on the conditions observed at the time of my visit to this building, I certify that the information contained within this statement is accurate.

**Meets Industry Standards**[6] **for Indoor Environmental Conditions:**

| | |
|---|---|
| Ventilation for Acceptable Indoor Air Quality | **N/A** |
| Acceptable Thermal Environmental Conditions | **N/A** |
| Adequate Illumination | **N/A** |

**Certifying Professional**
Raymond Johnson
520 South Burnt Mill Road
Voorhees, NJ 08043

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.
5. Values represent energy intensity, annualized to a 12-month period.
6. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

# ENERGY STAR® Data Checklist for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) must validate the accuracy of the data underlying the building's energy performance rating. This checklist is designed to provide an at-a-glance summary of a property's physical and operating characteristics, as well as its total energy consumption, to assist the PE in double-checking the information that the building owner or operator has entered into Portfolio Manager.

**Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.**
NOTE: You must check each box to indicate that each value is correct, OR include a note.

| CRITERION | VALUE AS ENTERED IN PORTFOLIO MANAGER | VERIFICATION QUESTIONS | NOTES | ☑ |
|---|---|---|---|---|
| **Building Name** | Lafayette Avenue School | Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings? | | ☐ |
| **Type** | K-12 School | Is this an accurate description of the space in question? | | ☐ |
| **Location** | 221 Lafayette Ave, Chatham, NJ 07928 | Is this address accurate and complete? Correct weather normalization requires an accurate zip code. | | ☐ |
| **Single Structure** | Single Facility | Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building | | ☐ |
| Lafayette 1995 Addition (K-12 School) | | | | |
| **CRITERION** | **VALUE AS ENTERED IN PORTFOLIO MANAGER** | **VERIFICATION QUESTIONS** | **NOTES** | ☑ |
| **Gross Floor Area** | 12,438 Sq. Ft. | Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area. | | ☐ |
| **Open Weekends?** | No | Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days. | | ☐ |
| **Number of PCs** | 14 | Is this the number of personal computers in the K12 School? | | ☐ |
| **Number of walk-in refrigeration/freezer units** | 0 | Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas. | | ☐ |
| **Presence of cooking facilities** | No | Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no". | | ☐ |
| **Percent Cooled** | 100 % | Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment? | | ☐ |
| **Percent Heated** | 100 % | Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment? | | ☐ |
| **Months** | 12 (Optional) | Is this school in operation for at least 8 months of the year? | | ☐ |

| | | | | |
|---|---|---|---|---|
| **High School?** | No | Is this building a high school (teaching grades 10, 11, and/or 12)? If the building teaches to high school students at all, the user should check 'yes' to 'high school'. For example, if the school teaches to grades K-12 (elementary/middle and high school), the user should check 'yes' to 'high school'. | | ☐ |

Lafayette 2001 Addition (K-12 School)

| CRITERION | VALUE AS ENTERED IN PORTFOLIO MANAGER | VERIFICATION QUESTIONS | NOTES | ☑ |
|---|---|---|---|---|
| **Gross Floor Area** | 10,425 Sq. Ft. | Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area. | | ☐ |
| **Open Weekends?** | No | Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days. | | ☐ |
| **Number of PCs** | 9 | Is this the number of personal computers in the K12 School? | | ☐ |
| **Number of walk-in refrigeration/freezer units** | 0 | Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas. | | ☐ |
| **Presence of cooking facilities** | No | Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no". | | ☐ |
| **Percent Cooled** | 100 % | Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment? | | ☐ |
| **Percent Heated** | 100 % | Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment? | | ☐ |
| **Months** | 12 (Optional) | Is this school in operation for at least 8 months of the year? | | ☐ |
| **High School?** | No | Is this building a high school (teaching grades 10, 11, and/or 12)? If the building teaches to high school students at all, the user should check 'yes' to 'high school'. For example, if the school teaches to grades K-12 (elementary/middle and high school), the user should check 'yes' to 'high school'. | | ☐ |

Lafayette 2006 Addition (K-12 School)

| CRITERION | VALUE AS ENTERED IN PORTFOLIO MANAGER | VERIFICATION QUESTIONS | NOTES | ☑ |
|---|---|---|---|---|
| **Gross Floor Area** | 12,543 Sq. Ft. | Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area. | | ☐ |

| | | | | |
|---|---|---|---|---|
| **Open Weekends?** | No | Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days. | | ☐ |
| **Number of PCs** | 25 | Is this the number of personal computers in the K12 School? | | ☐ |
| **Number of walk-in refrigeration/freezer units** | 0 | Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas. | | ☐ |
| **Presence of cooking facilities** | No | Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no". | | ☐ |
| **Percent Cooled** | 100 % | Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment? | | ☐ |
| **Percent Heated** | 100 % | Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment? | | ☐ |
| **Months** | 12 (Optional) | Is this school in operation for at least 8 months of the year? | | ☐ |
| **High School?** | No | Is this building a high school (teaching grades 10, 11, and/or 12)? If the building teaches to high school students at all, the user should check 'yes' to 'high school'. For example, if the school teaches to grades K-12 (elementary/middle and high school), the user should check 'yes' to 'high school'. | | ☐ |

Lafayette Original Bldg (K-12 School)

| CRITERION | VALUE AS ENTERED IN PORTFOLIO MANAGER | VERIFICATION QUESTIONS | NOTES | ☑ |
|---|---|---|---|---|
| **Gross Floor Area** | 39,862 Sq. Ft. | Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area. | | ☐ |
| **Open Weekends?** | No | Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days. | | ☐ |
| **Number of PCs** | 88 | Is this the number of personal computers in the K12 School? | | ☐ |
| **Number of walk-in refrigeration/freezer units** | 0 | Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas. | | ☐ |
| **Presence of cooking facilities** | Yes | Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no". | | ☐ |
| **Percent Cooled** | 100 % | Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment? | | ☐ |

| | | | | |
|---|---|---|---|---|
| **Percent Heated** | 100 % | Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment? | | |
| **Months** | 12 (Optional) | Is this school in operation for at least 8 months of the year? | | |
| **High School?** | No | Is this building a high school (teaching grades 10, 11, and/or 12)? If the building teaches to high school students at all, the user should check 'yes' to 'high school'. For example, if the school teaches to grades K-12 (elementary/middle and high school), the user should check 'yes' to 'high school'. | | |

# ENERGY STAR® Data Checklist for Commercial Buildings

## *Energy Consumption*

***Power Generation Plant or Distribution Utility:*** Jersey Central Power & Lt Co

**Fuel Type: Electricity**

**Meter: Lafayette Electric (kWh (thousand Watt-hours))**
**Space(s):** Entire Facility
**Generation Method:** Grid Purchase

| Start Date | End Date | Energy Use (kWh (thousand Watt-hours)) |
|---|---|---|
| 07/01/2009 | 07/31/2009 | 36,027.00 |
| 06/01/2009 | 06/30/2009 | 38,221.00 |
| 05/01/2009 | 05/31/2009 | 52,021.00 |
| 04/01/2009 | 04/30/2009 | 37,031.00 |
| 03/01/2009 | 03/31/2009 | 43,029.00 |
| 02/01/2009 | 02/28/2009 | 54,648.00 |
| 01/01/2009 | 01/31/2009 | 58,364.00 |
| 12/01/2008 | 12/31/2008 | 55,646.00 |
| 11/01/2008 | 11/30/2008 | 61,423.00 |
| 10/01/2008 | 10/31/2008 | 60,359.00 |
| 09/01/2008 | 09/30/2008 | 54,920.00 |
| 08/01/2008 | 08/31/2008 | 55,946.00 |
| **Lafayette Electric Consumption (kWh (thousand Watt-hours))** | | **607,635.00** |
| **Lafayette Electric Consumption (kBtu (thousand Btu))** | | **2,073,250.62** |
| **Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))** | | **2,073,250.62** |
| **Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?** | | ☐ |

**Fuel Type: Natural Gas**

**Meter: Lafayette Gas Meter (therms)**
**Space(s):** Entire Facility

| Start Date | End Date | Energy Use (therms) |
|---|---|---|
| 07/01/2009 | 07/31/2009 | 118.21 |
| 06/01/2009 | 06/30/2009 | 191.69 |
| 05/01/2009 | 05/31/2009 | 445.77 |
| 04/01/2009 | 04/30/2009 | 2,751.75 |
| 03/01/2009 | 03/31/2009 | 7,729.24 |
| 02/01/2009 | 02/28/2009 | 9,907.93 |
| 01/01/2009 | 01/31/2009 | 13,253.04 |
| 12/01/2008 | 12/31/2008 | 12,125.22 |
| 11/01/2008 | 11/30/2008 | 11,904.14 |
| 10/01/2008 | 10/31/2008 | 5,609.23 |

| | | |
|---|---|---|
| 09/01/2008 | 09/30/2008 | 600.23 |
| 08/01/2008 | 08/31/2008 | 174.42 |
| **Lafayette Gas Meter Consumption (therms)** | | **64,810.87** |
| **Lafayette Gas Meter Consumption (kBtu (thousand Btu))** | | **6,481,087.00** |
| **Total Natural Gas Consumption (kBtu (thousand Btu))** | | **6,481,087.00** |
| **Is this the total Natural Gas consumption at this building including all Natural Gas meters?** | | ☐ |

| **Additional Fuels** | |
|---|---|
| Do the fuel consumption totals shown above represent the total energy use of this building? Please confirm there are no additional fuels (district energy, generator fuel oil) used in this facility. | ☐ |

| **On-Site Solar and Wind Energy** | |
|---|---|
| Do the fuel consumption totals shown above include all on-site solar and/or wind power located at your facility? Please confirm that no on-site solar or wind installations have been omitted from this list. All on-site systems must be reported. | ☐ |

## Certifying Professional

(When applying for the ENERGY STAR, the Certifying Professional must be the same as the PE that signed and stamped the SEP.)

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

# FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

Please keep this Facility Summary for your own records; do not submit it to EPA. Only the Statement of Energy Performance (SEP), Data Checklist and Letter of Agreement need to be submitted to EPA when applying for the ENERGY STAR.

**Facility**
Lafayette Avenue School
221 Lafayette Ave
Chatham, NJ 07928

**Facility Owner**
School District of the Chathams
58 Meyersville Road
Chatham, NJ 07928

**Primary Contact for this Facility**
Ralph Goodwin
58 Meyersville Road
Chatham, NJ 07928

## General Information

| Lafayette Avenue School | |
|---|---|
| Gross Floor Area Excluding Parking: (ft²) | 75,268 |
| Year Built | 1954 |
| For 12-month Evaluation Period Ending Date: | July 31, 2009 |

## Facility Space Use Summary

| Lafayette 1995 Addition | |
|---|---|
| Space Type | K-12 School |
| Gross Floor Area(ft²) | 12,438 |
| Open Weekends? | No |
| Number of PCs | 14 |
| Number of walk-in refrigeration/freezer units | 0 |
| Presence of cooking facilities | No |
| Percent Cooled | 100 |
| Percent Heated | 100 |
| Months° | 12 |
| High School? | No |
| School District° | Chatham |

| Lafayette 2006 Addition | |
|---|---|
| Space Type | K-12 School |
| Gross Floor Area(ft²) | 12,543 |
| Open Weekends? | No |
| Number of PCs | 25 |
| Number of walk-in refrigeration/freezer units | 0 |
| Presence of cooking facilities | No |
| Percent Cooled | 100 |
| Percent Heated | 100 |
| Months° | 12 |
| High School? | No |
| School District° | Chatham |

| Lafayette 2001 Addition | |
|---|---|
| Space Type | K-12 School |
| Gross Floor Area(ft²) | 10,425 |
| Open Weekends? | No |
| Number of PCs | 9 |
| Number of walk-in refrigeration/freezer units | 0 |
| Presence of cooking facilities | No |
| Percent Cooled | 100 |
| Percent Heated | 100 |
| Months° | 12 |
| High School? | No |
| School District° | Chatham |

| Lafayette Original Bldg | |
|---|---|
| Space Type | K-12 School |
| Gross Floor Area(ft²) | 39,862 |
| Open Weekends? | No |
| Number of PCs | 88 |
| Number of walk-in refrigeration/freezer units | 0 |
| Presence of cooking facilities | Yes |
| Percent Cooled | 100 |
| Percent Heated | 100 |
| Months° | 12 |
| High School? | No |
| School District° | Chatham |

## Energy Performance Comparison

| | Evaluation Periods | | Comparisons | | |
|---|---|---|---|---|---|
| **Performance Metrics** | **Current** (Ending Date 07/31/2009) | **Baseline** (Ending Date 07/31/2009) | **Rating of 75** | **Target** | **National Average** |
| Energy Performance Rating | 25 | 25 | 75 | N/A | 50 |
| Energy Intensity | | | | | |
| *Site (kBtu/ft²)* | 114 | 114 | 71 | N/A | 90 |
| *Source (kBtu/ft²)* | 182 | 182 | 113 | N/A | 145 |
| Energy Cost | | | | | |
| *$/year* | $ 206,595.74 | $ 206,595.74 | $ 128,520.18 | N/A | $ 164,331.32 |

| | | | | | |
|---|---|---|---|---|---|
| *$/ft²/year* | $ 2.74 | $ 2.74 | $ 1.70 | N/A | $ 2.18 |
| Greenhouse Gas Emissions | | | | | |
| $MtCO_2e$/year | 661 | 661 | 411 | N/A | 526 |
| $kgCO_2e/ft^2$/year | 9 | 9 | 6 | N/A | 7 |

More than 50% of your building is defined as K-12 School. Please note that your rating accounts for all of the spaces listed. The National Average column presents energy performance data your building would have if your building had an average rating of 50.

Notes:
o - This attribute is optional.
d - A default value has been supplied by Portfolio Manager.

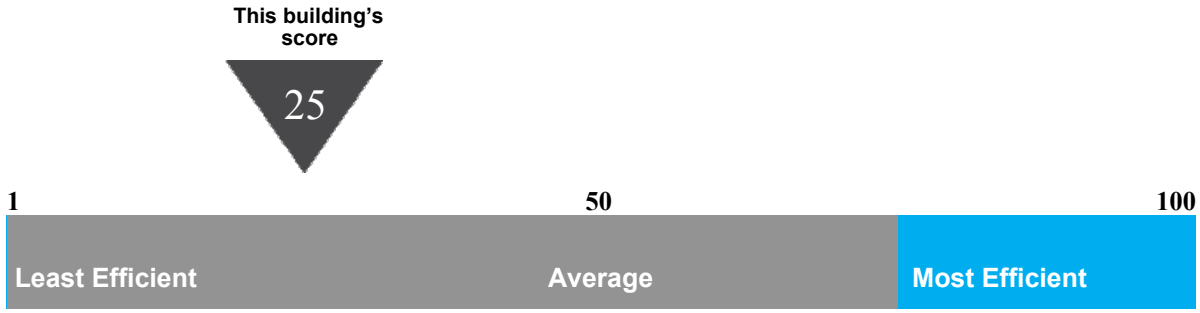
# Statement of Energy Performance

## 2009

Lafayette Avenue School
221 Lafayette Ave
Chatham, NJ 07928

Portfolio Manager Building ID: 1830623

The energy use of this building has been measured and compared to other similar buildings using the Environmental Protection Agency's (EPA's) Energy Performance Scale of 1–100, with 1 being the least energy efficient and 100 the most energy efficient. For more information, visit energystar.gov/benchmark.




This building uses 182 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending July 2009

**Buildings with a score of 75 or higher may qualify for EPA's ENERGY STAR.**

I certify that the information contained within this statement is accurate and in accordance with U.S. Environmental Protection Agency's measurement standards, found at energystar.gov

Date of certification

EPA United States Environmental Protection Agency

Date Generated: 10/06/2009

**CEG Job #:** 9C09078
**Project:** Chatham School District
**Address:** 221 Lafayette Avenue
**City:** Chatham
**Building SF:** 75,268

# Lafayette Avenue School

**DATE:** 11/3/2009
**KWH COST:** $0.179

## ECM #1: Lighting Upgrade - General

| EXISTING LIGHTING | | | | | | | | | | PROPOSED LIGHTING | | | | | | | | | | SAVINGS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CEG Type | Fixture Location | Yearly Usage | No. Fixts | No. Lamps | Fixture Type | Fixt Watts | Total kW | kWh/Yr Fixtures | Yearly $ Cost | No. Fixts | No. Lamps | Retro-Unit Description | Watts Used | Total kW | kWh/Yr Fixtures | Yearly $ Cost | Unit Cost (INSTALLED) | Total Cost | kW Savings | kWh/Yr Savings | Yearly $ Savings | Yearly Simple Payback |
| 2 | Room 32 | 2080 | 15 | 3 | T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens | 82 | 1.23 | 2,558.4 | $457.95 | 15 | 0 | No Replacement | 82 | 1.23 | 2558.4 | $457.95 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 2 | Room 30 | 2080 | 15 | 3 | T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens | 82 | 1.23 | 2,558.4 | $457.95 | 15 | 0 | No Replacement | 82 | 1.23 | 2558.4 | $457.95 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 2 | Room 29 | 2080 | 15 | 3 | T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens | 82 | 1.23 | 2,558.4 | $457.95 | 15 | 0 | No Replacement | 82 | 1.23 | 2558.4 | $457.95 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Room 9 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | No Replacement | 82 | 0.98 | 2046.72 | $366.36 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Room 8 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | No Replacement | 82 | 0.98 | 2046.72 | $366.36 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 1 | Room 8 | 2080 | 4 | 2 | T8 1x4 2 Lamps Electronic Ballast Pendant Parabolic | 58 | 0.23 | 482.6 | $86.38 | 4 | 0 | No Replacement | 58 | 0.23 | 482.56 | $86.38 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Room 7 | 2080 | 12 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.70 | 1,447.7 | $259.13 | 12 | 0 | No Replacement | 58 | 0.70 | 1447.68 | $259.13 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Room 6 | 2080 | 12 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.70 | 1,447.7 | $259.13 | 12 | 0 | No Replacement | 58 | 0.70 | 1447.68 | $259.13 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Room 5 | 2080 | 12 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.70 | 1,447.7 | $259.13 | 12 | 0 | No Replacement | 58 | 0.70 | 1447.68 | $259.13 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Room 4 | 2080 | 12 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.70 | 1,447.7 | $259.13 | 12 | 0 | No Replacement | 58 | 0.70 | 1447.68 | $259.13 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Room 3 | 2080 | 12 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.70 | 1,447.7 | $259.13 | 12 | 0 | No Replacement | 58 | 0.70 | 1447.68 | $259.13 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Room 2 | 2080 | 12 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.70 | 1,447.7 | $259.13 | 12 | 0 | No Replacement | 58 | 0.70 | 1447.68 | $259.13 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Room 1 | 2080 | 12 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.70 | 1,447.7 | $259.13 | 12 | 0 | No Replacement | 58 | 0.70 | 1447.68 | $259.13 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 5 | Closet | 520 | 1 | 1 | Incadescent | 100 | 0.10 | 52.0 | $9.31 | 1 | 0 | Eiko-30w mini sprial | 30 | 0.03 | 15.6 | $2.79 | $6.00 | $6.00 | 0.07 | 36.4 | $6.52 | 0.92 |
| 2 | Art Room | 2080 | 20 | 3 | T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens | 82 | 1.64 | 3,411.2 | $610.60 | 20 | 0 | No Replacement | 82 | 1.64 | 3411.2 | $610.60 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Art Room | 2080 | 3 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.25 | 511.7 | $91.59 | 3 | 0 | No Replacement | 82 | 0.25 | 511.68 | $91.59 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Office | 2080 | 9 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.74 | 1,535.0 | $274.77 | 9 | 0 | No Replacement | 82 | 0.74 | 1535.04 | $274.77 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 1 | Office | 2080 | 3 | 2 | T8 1x4 2 Lamps Electronic Ballast Pendant Parabolic | 58 | 0.17 | 361.9 | $64.78 | 3 | 0 | No Replacement | 58 | 0.17 | 361.92 | $64.78 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Faculty Room | 2080 | 4 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.23 | 482.6 | $86.38 | 4 | 0 | No Replacement | 58 | 0.23 | 482.56 | $86.38 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 8 | Faculty Room | 2080 | 2 | 2 | 2'x2' 2-Lamp T-8 U-Tube, Prism Lens Electronic Ballast | 73 | 0.15 | 303.7 | $54.36 | 2 | 2 | 2'x2' 2-Lamp T-8, Prism Lens Electronic Ballast, Architectural surface or Recessed static METALUX 2AC-217-UNV-EB81-U | 34 | 0.07 | 141.44 | $25.32 | $204.00 | $408.00 | 0.08 | 162.24 | $29.04 | 14.05 |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | Faculty Room | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | No Replacement | 82 | 0.98 | 2046.72 | $366.36 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 6 | Closet | 520 | 1 | 1 | Incandescent | 120 | 0.12 | 62.4 | $11.17 | 1 | 0 | 30 W CFL Lamp | 30 | 0.03 | 15.6 | $2.79 | $8.88 | $8.88 | 0.09 | 46.8 | $8.38 | 1.06 |
| 7 | Closet | 520 | 1 | 1 | Incandescent | 150 | 0.15 | 78.0 | $13.96 | 1 | 0 | 40 W CFL Lamp | 40 | 0.04 | 20.8 | $3.72 | $9.60 | $9.60 | 0.11 | 57.2 | $10.24 | 0.94 |
| 1 | Custodian Closet | 520 | 2 | 2 | T8 1x4 2 Lamps Electronic Ballast Pendant Parabolic | 58 | 0.12 | 60.3 | $10.80 | 2 | 0 | No Replacement | 58 | 0.12 | 60.32 | $10.80 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 5 | Custodian Closet | 520 | 1 | 1 | Incadescent | 100 | 0.10 | 52.0 | $9.31 | 1 | 0 | Eiko-30w mini sprial | 30 | 0.03 | 15.6 | $2.79 | $6.00 | $6.00 | 0.07 | 36.4 | $6.52 | 0.92 |
| 10 | Stairwell | 8760 | 2 | 4 | 4' - 4 lamp T-8, Parabolic, Electronic Ballast | 109 | 0.22 | 1,909.7 | $341.83 | 2 | 3 | 4' - 3-Lamp 32W T-8 Industrial Strip w/ Elect Ballast; Metalux M/N SNF332 | 82 | 0.16 | 1436.64 | $257.16 | $143.00 | $286.00 | 0.05 | 473.04 | $84.67 | 3.38 |
| 1 | Stairwell | 8760 | 1 | 2 | T8 1x4 2 Lamps Electronic Ballast Pendant Parabolic | 58 | 0.06 | 508.1 | $90.95 | 1 | 0 | No Replacement | 58 | 0.06 | 508.08 | $90.95 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Stairwell | 8760 | 6 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.49 | 4,309.9 | $771.48 | 6 | 0 | No Replacement | 82 | 0.49 | 4309.92 | $771.48 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 9 | Hallway | 8760 | 15 | 3 | 2'x2' 3-Lamp T-8 twin-Tube, Prism Lens Electronic Ballast | 108 | 1.62 | 14,191.2 | $2,540.22 | 15 | 2 | 2'x2' 2-Lamp T-8, Prism Lens Electronic Ballast, Architectural surface or Recessed static METALUX 2AC-217-UNV-EB81-U | 34 | 0.51 | 4467.6 | $799.70 | $204.00 | $3,060.00 | 1.11 | 9723.6 | $1,740.52 | 1.76 |
| 11 | Hallway | 8760 | 14 | 2 | High Hat - CFL | 26 | 0.36 | 3,188.6 | $570.77 | 14 | 2 | No Replacement | 26 | 0.36 | 3188.64 | $570.77 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Bathrooms | 2600 | 4 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.23 | 603.2 | $107.97 | 4 | 0 | No Replacement | 58 | 0.23 | 603.2 | $107.97 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Closets | 520 | 4 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.23 | 120.6 | $21.59 | 4 | 0 | No Replacement | 58 | 0.23 | 120.64 | $21.59 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Room 23 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | No Replacement | 82 | 0.98 | 2046.72 | $366.36 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Room 24 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | No Replacement | 82 | 0.98 | 2046.72 | $366.36 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Room 25 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | No Replacement | 82 | 0.98 | 2046.72 | $366.36 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Hallway | 8760 | 21 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 1.22 | 10,669.7 | $1,909.87 | 21 | 0 | No Replacement | 58 | 1.22 | 10669.68 | $1,909.87 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 12 | Hallway | 8760 | 3 | 6 | 4'x4' 6 lamp T8 Prism Lens Electronic Ballast | 167 | 0.50 | 4,388.8 | $785.59 | 3 | 6 | No Replacement | 167 | 0.50 | 4388.76 | $785.59 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 1 | Boiler Room | 2600 | 6 | 2 | T8 1x4 2 Lamps Electronic Ballast Pendant Parabolic | 58 | 0.35 | 904.8 | $161.96 | 6 | 0 | No Replacement | 58 | 0.35 | 904.8 | $161.96 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 7 | Boiler Room | 2080 | 1 | 1 | Incandescent | 150 | 0.15 | 312.0 | $55.85 | 1 | 0 | 40 W CFL Lamp | 40 | 0.04 | 83.2 | $14.89 | $9.60 | $9.60 | 0.11 | 228.8 | $40.96 | 0.23 |
| 3 | Closet | 520 | 1 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.06 | 30.2 | $5.40 | 1 | 0 | No Replacement | 58 | 0.06 | 30.16 | $5.40 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 2 | Conference Room | 8760 | 4 | 3 | T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens | 82 | 0.33 | 2,873.3 | $514.32 | 4 | 0 | No Replacement | 82 | 0.33 | 2873.28 | $514.32 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 11 | Conference Room | 2080 | 3 | 2 | High Hat - CFL | 26 | 0.08 | 162.2 | $29.04 | 3 | 2 | No Replacement | 26 | 0.08 | 162.24 | $29.04 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Conference Room | 2080 | 1 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.06 | 120.6 | $21.59 | 1 | 0 | No Replacement | 58 | 0.06 | 120.64 | $21.59 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 1 | Conference Room | 2080 | 2 | 2 | T8 1x4 2 Lamps Electronic Ballast Pendant Parabolic | 58 | 0.12 | 241.3 | $43.19 | 2 | 0 | No Replacement | 58 | 0.12 | 241.28 | $43.19 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 2 | SG1 | 2080 | 14 | 3 | T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens | 82 | 1.15 | 2,387.8 | $427.42 | 14 | 0 | No Replacement | 82 | 1.15 | 2387.84 | $427.42 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | SG1 | 2080 | 2 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.16 | 341.1 | $61.06 | 2 | 0 | No Replacement | 82 | 0.16 | 341.12 | $61.06 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Bathrooms | 2600 | 4 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.23 | 603.2 | $107.97 | 4 | 0 | No Replacement | 58 | 0.23 | 603.2 | $107.97 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Room 22 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | No Replacement | 82 | 0.98 | 2046.72 | $366.36 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | Room 21 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | No Replacement | 82 | 0.98 | 2046.72 | $366.36 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Room 20 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | No Replacement | 82 | 0.98 | 2046.72 | $366.36 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Room 19 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | No Replacement | 82 | 0.98 | 2046.72 | $366.36 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 12 | Library Conference Rm | 2080 | 4 | 6 | 4'x4' 6 lamp T8 Prism Lens Electronic Ballast | 167 | 0.67 | 1,389.4 | $248.71 | 4 | 6 | No Replacement | 167 | 0.67 | 1389.44 | $248.71 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 8 | Library | 2080 | 16 | 2 | 2'x2' 2-Lamp T-8 U-Tube, Prism Lens Electronic Ballast | 73 | 1.17 | 2,429.4 | $434.87 | 16 | 2 | 2'x2' 2-Lamp T-8, Prism Lens Electronic Ballast, Architectural surface or Recessed static METALUX 2AC-217-UNV-EB81-U | 34 | 0.54 | 1131.52 | $202.54 | $204.00 | $3,264.00 | 0.62 | 1297.92 | $232.33 | 14.05 |
| 4 | Library | 2080 | 24 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 1.97 | 4,093.4 | $732.73 | 24 | 0 | No Replacement | 82 | 1.97 | 4093.44 | $732.73 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 11 | Library | 2080 | 15 | 2 | High Hat - CFL | 26 | 0.39 | 811.2 | $145.20 | 15 | 2 | No Replacement | 26 | 0.39 | 811.2 | $145.20 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 9 | Boys Room | 2600 | 5 | 3 | 2'x2' 3-Lamp T-8 twin-Tube, Prism Lens Electronic Ballast | 108 | 0.54 | 1,404.0 | $251.32 | 5 | 2 | 2'x2' 2-Lamp T-8, Prism Lens Electronic Ballast, Architectural surface or Recessed static METALUX 2AC-217-UNV-EB81-U | 34 | 0.17 | 442 | $79.12 | $204.00 | $1,020.00 | 0.37 | 962 | $172.20 | 5.92 |
| 9 | Girls Room | 2600 | 5 | 3 | 2'x2' 3-Lamp T-8 twin-Tube, Prism Lens Electronic Ballast | 108 | 0.54 | 1,404.0 | $251.32 | 5 | 2 | 2'x2' 2-Lamp T-8, Prism Lens Electronic Ballast, Architectural surface or Recessed static METALUX 2AC-217-UNV-EB81-U | 34 | 0.17 | 442 | $79.12 | $204.00 | $1,020.00 | 0.37 | 962 | $172.20 | 5.92 |
| 13 | Room 33 | 2080 | 15 | 15 | 1'x20' 3 lamp/4' T8 electronic Ballast direct/indirect | 410 | 6.15 | 12,792.0 | $2,289.77 | 15 | 15 | No Replacement | 410 | 6.15 | 12792 | $2,289.77 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 13 | Room 31 | 2080 | 15 | 15 | 1'x20' 3 lamp/4' T8 electronic Ballast direct/indirect | 410 | 6.15 | 12,792.0 | $2,289.77 | 15 | 15 | No Replacement | 410 | 6.15 | 12792 | $2,289.77 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Room 10 | 2080 | 10 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.82 | 1,705.6 | $305.30 | 10 | 0 | No Replacement | 82 | 0.82 | 1705.6 | $305.30 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Room 11 | 2080 | 10 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.82 | 1,705.6 | $305.30 | 10 | 0 | No Replacement | 82 | 0.82 | 1705.6 | $305.30 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Boys Room | 2600 | 3 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.17 | 452.4 | $80.98 | 3 | 0 | No Replacement | 58 | 0.17 | 452.4 | $80.98 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Girls Room | 2600 | 3 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.17 | 452.4 | $80.98 | 3 | 0 | No Replacement | 58 | 0.17 | 452.4 | $80.98 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Custodial Closet | 520 | 1 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.06 | 30.2 | $5.40 | 1 | 0 | No Replacement | 58 | 0.06 | 30.16 | $5.40 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Room 12 | 2080 | 10 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.58 | 1,206.4 | $215.95 | 10 | 0 | No Replacement | 58 | 0.58 | 1206.4 | $215.95 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Room 13 | 2080 | 10 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.82 | 1,705.6 | $305.30 | 10 | 0 | No Replacement | 82 | 0.82 | 1705.6 | $305.30 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Room 14 | 2080 | 10 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.82 | 1,705.6 | $305.30 | 10 | 0 | No Replacement | 82 | 0.82 | 1705.6 | $305.30 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 8 | Room 15 | 2080 | 16 | 2 | 2'x2' 2-Lamp T-8 U-Tube, Prism Lens Electronic Ballast | 73 | 1.17 | 2,429.4 | $434.87 | 16 | 2 | 2'x2' 2-Lamp T-8, Prism Lens Electronic Ballast, Architectural surface or Recessed static METALUX 2AC-217-UNV-EB81-U | 34 | 0.54 | 1131.52 | $202.54 | $204.00 | $3,264.00 | 0.62 | 1297.92 | $232.33 | 14.05 |
| 4 | Room 15 | 2080 | 2 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.16 | 341.1 | $61.06 | 2 | 0 | No Replacement | 82 | 0.16 | 341.12 | $61.06 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Boys Room | 2600 | 2 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.12 | 301.6 | $53.99 | 2 | 0 | No Replacement | 58 | 0.12 | 301.6 | $53.99 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | Girls Room | 2600 | 3 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.17 | 452.4 | $80.98 | 3 | 0 | No Replacement | 58 | 0.17 | 452.4 | $80.98 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 13 | Room 15 | 2080 | 15 | 15 | 1'x20' 3 lamp/4' T8 electronic Ballast direct/indirect | 410 | 6.15 | 12,792.0 | $2,289.77 | 15 | 15 | No Replacement | 410 | 6.15 | 12792 | $2,289.77 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 5 | Restroom | 2600 | 1 | 1 | Incadescent | 100 | 0.10 | 260.0 | $46.54 | 1 | 0 | Eiko-30w mini sprial | 30 | 0.03 | 78 | $13.96 | $6.00 | $6.00 | 0.07 | 182 | $32.58 | 0.18 |
| 4 | Cafeteria | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | No Replacement | 82 | 0.98 | 2046.72 | $366.36 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 14 | Cafeteria | 2080 | 15 | 4 | 2x4 4 lamp T-8 | 128 | 1.92 | 3,993.6 | $714.85 | 15 | 4 | No Replacement | 128 | 1.92 | 3993.6 | $714.85 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Music Tech | 2080 | 16 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 1.31 | 2,729.0 | $488.48 | 16 | 0 | No Replacement | 82 | 1.31 | 2728.96 | $488.48 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 15 | Kitchen | 2080 | 2 | 2 | 1'x8' 2-Lamp 75T12 Prismatic Lens Magnetic Ballast | 158 | 0.32 | 657.3 | $117.65 | 2 | 4 | (2) 1'x4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N GC | 110 | 0.22 | 457.6 | $81.91 | $200.00 | $400.00 | 0.10 | 199.68 | $35.74 | 11.19 |
| 16 | Kitchen | 2080 | 2 | 1 | 4' - 1 lamp T-12, No Lens, Magnetic Ballast | 57 | 0.11 | 237.1 | $42.44 | 2 | 1 | 4' - 1-Lamp 32W T-8 Industrial Strip w/ Elect Ballast; Metalux M/N SNF132 | 28 | 0.06 | 116.48 | $20.85 | $123.00 | $246.00 | 0.06 | 120.64 | $21.59 | 11.39 |
| 3 | Hallway | 8760 | 13 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.75 | 6,605.0 | $1,182.30 | 13 | 0 | No Replacement | 58 | 0.75 | 6605.04 | $1,182.30 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 8 | Hallway | 8760 | 1 | 2 | 2'x2' 2-Lamp T-8 U-Tube, Prism Lens Electronic Ballast | 73 | 0.07 | 639.5 | $114.47 | 1 | 2 | 2'x2' 2-Lamp T-8, Prism Lens Electronic Ballast, Architectural surface or Recessed static METALUX 2AC-217-UNV-EB81-U | 34 | 0.03 | 297.84 | $53.31 | $204.00 | $204.00 | 0.04 | 341.64 | $61.15 | 3.34 |
| 3 | Hallway | 8760 | 20 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 1.16 | 10,161.6 | $1,818.93 | 20 | 0 | No Replacement | 58 | 1.16 | 10161.6 | $1,818.93 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 11 | Hallway | 8760 | 2 | 2 | High Hat - CFL | 26 | 0.05 | 455.5 | $81.54 | 2 | 2 | No Replacement | 26 | 0.05 | 455.52 | $81.54 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Room 28 | 2080 | 8 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.66 | 1,364.5 | $244.24 | 8 | 0 | No Replacement | 82 | 0.66 | 1364.48 | $244.24 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Room 27 | 2080 | 8 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.66 | 1,364.5 | $244.24 | 8 | 0 | No Replacement | 82 | 0.66 | 1364.48 | $244.24 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Room 26 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | No Replacement | 82 | 0.98 | 2046.72 | $366.36 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Hallway | 8760 | 14 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.81 | 7,113.1 | $1,273.25 | 14 | 0 | No Replacement | 58 | 0.81 | 7113.12 | $1,273.25 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Offices | 2080 | 22 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 1.80 | 3,752.3 | $671.67 | 22 | 0 | No Replacement | 82 | 1.80 | 3752.32 | $671.67 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 17 | Custodial Closet | 520 | 1 | 2 | 1'x4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N GC | 58 | 0.06 | 30.2 | $5.40 | 1 | 2 | No Replacement | 58 | 0.06 | 30.16 | $5.40 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Room 16 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | No Replacement | 82 | 0.98 | 2046.72 | $366.36 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Room 17 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | No Replacement | 82 | 0.98 | 2046.72 | $366.36 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Room 18 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | No Replacement | 82 | 0.98 | 2046.72 | $366.36 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 19 | Throughout | 8760 | 25 | 0 | Exit Sign - LED | 4 | 0.10 | 876.0 | $156.80 | 25 | 0 | No Replacement | 4 | 0.10 | 876 | $156.80 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| | **Totals** | | 812 | 264 | | | 74.43 | 206,404.5 | $36,946.40 | 812 | 93 | | | 70.487 | 190276.2 | $34,059.44 | | $13,218.08 | 3.94 | 16128.3 | $2,886.96 | 4.58 |

**NOTES:** 1. Simple Payback noted in this spreadsheet does not include Maintenance Savings and NJ Smart Start Incentives.

**CEG Job #:** 9C09078
**Project:** Chatham School District
**Address:** 221 Lafayette Avenue
**City:** Chatham
**Building SF:** 75,268

# Lafatette Avenue School

**DATE:** 11/3/2009
**KWH COST:** $0.179

## ECM #2: Lighting Controls

| EXISTING LIGHTING | | | | | | | | | | PROPOSED LIGHTING | | | | | | | | | | SAVINGS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CEG Type | Fixture Location | Yearly Usage | No. Fixts | No. Lamps | Fixture Type | Fixt Watts | Total kW | kWh/Yr Fixtures | Yearly $ Cost | No. Fixts | No. Lamps | Controls Description | Watts Used | Total kW | Reduction (%) | kWh/Yr Fixtures | Yearly $ Cost | Unit Cost INSTALLED | Total Cost | kW Savings | kWh/Yr Savings | Yearly $ Savings | Yearly Simple Payback |
| 2 | Room 32 | 2080 | 15 | 3 | T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens | 82 | 1.23 | 2,558.4 | $457.95 | 15 | 0 | Dual Technology Occupancy Sensor | 82 | 1.23 | 10% | 2302.56 | $412.16 | $0.00 | $0.00 | 0.00 | 255.84 | $45.80 | 0.00 |
| 2 | Room 30 | 2080 | 15 | 3 | T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens | 82 | 1.23 | 2,558.4 | $457.95 | 15 | 0 | Dual Technology Occupancy Sensor | 82 | 1.23 | 10% | 2302.56 | $412.16 | $0.00 | $0.00 | 0.00 | 255.84 | $45.80 | 0.00 |
| 2 | Room 29 | 2080 | 15 | 3 | T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens | 82 | 1.23 | 2,558.4 | $457.95 | 15 | 0 | Dual Technology Occupancy Sensor | 82 | 1.23 | 10% | 2302.56 | $412.16 | $0.00 | $0.00 | 0.00 | 255.84 | $45.80 | 0.00 |
| 4 | Room 9 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | Dual Technology Occupancy Sensor | 82 | 0.98 | 10% | 1842.05 | $329.73 | $0.00 | $0.00 | 0.00 | 204.672 | $36.64 | 0.00 |
| 4 | Room 8 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | Dual Technology Occupancy Sensor | 82 | 0.98 | 10% | 1842.05 | $329.73 | $0.00 | $0.00 | 0.00 | 204.672 | $36.64 | 0.00 |
| 1 | Room 8 | 2080 | 4 | 2 | T8 1x4 2 Lamps Electronic Ballast Pendant Parabolic | 58 | 0.23 | 482.6 | $86.38 | 4 | 0 | Dual Technology Occupancy Sensor | 58 | 0.23 | 10% | 434.30 | $77.74 | $160.00 | $160.00 | 0.00 | 48.256 | $8.64 | 18.52 |
| 3 | Room 7 | 2080 | 12 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.70 | 1,447.7 | $259.13 | 12 | 0 | Dual Technology Occupancy Sensor | 58 | 0.70 | 10% | 1302.91 | $233.22 | $160.00 | $160.00 | 0.00 | 144.768 | $25.91 | 6.17 |
| 3 | Room 6 | 2080 | 12 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.70 | 1,447.7 | $259.13 | 12 | 0 | Dual Technology Occupancy Sensor | 58 | 0.70 | 10% | 1302.91 | $233.22 | $160.00 | $160.00 | 0.00 | 144.768 | $25.91 | 6.17 |
| 3 | Room 5 | 2080 | 12 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.70 | 1,447.7 | $259.13 | 12 | 0 | Dual Technology Occupancy Sensor | 58 | 0.70 | 10% | 1302.91 | $233.22 | $0.00 | $0.00 | 0.00 | 144.768 | $25.91 | 0.00 |
| 3 | Room 4 | 2080 | 12 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.70 | 1,447.7 | $259.13 | 12 | 0 | Dual Technology Occupancy Sensor | 58 | 0.70 | 10% | 1302.91 | $233.22 | $160.00 | $160.00 | 0.00 | 144.768 | $25.91 | 6.17 |
| 3 | Room 3 | 2080 | 12 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.70 | 1,447.7 | $259.13 | 12 | 0 | Dual Technology Occupancy Sensor | 58 | 0.70 | 10% | 1302.91 | $233.22 | $160.00 | $160.00 | 0.00 | 144.768 | $25.91 | 6.17 |
| 3 | Room 2 | 2080 | 12 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.70 | 1,447.7 | $259.13 | 12 | 0 | Dual Technology Occupancy Sensor | 58 | 0.70 | 10% | 1302.91 | $233.22 | $160.00 | $160.00 | 0.00 | 144.768 | $25.91 | 6.17 |
| 3 | Room 1 | 2080 | 12 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.70 | 1,447.7 | $259.13 | 12 | 0 | Dual Technology Occupancy Sensor | 58 | 0.70 | 10% | 1302.91 | $233.22 | $0.00 | $0.00 | 0.00 | 144.768 | $25.91 | 0.00 |
| 5 | Closet | 520 | 1 | 1 | Incadescent | 100 | 0.10 | 52.0 | $9.31 | 1 | 0 | No Change | 100 | 0.10 | 0% | 52.00 | $9.31 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 2 | Art Room | 2080 | 20 | 3 | T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens | 82 | 1.64 | 3,411.2 | $610.60 | 20 | 0 | Dual Technology Occupancy Sensor | 82 | 1.64 | 10% | 3070.08 | $549.54 | $0.00 | $0.00 | 0.00 | 341.12 | $61.06 | 0.00 |
| 4 | Art Room | 2080 | 3 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.25 | 511.7 | $91.59 | 3 | 0 | Dual Technology Occupancy Sensor | 82 | 0.25 | 10% | 460.51 | $82.43 | $160.00 | $160.00 | 0.00 | 51.168 | $9.16 | 17.47 |
| 4 | Office | 2080 | 9 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.74 | 1,535.0 | $274.77 | 9 | 0 | Dual Technology Occupancy Sensor | 82 | 0.74 | 10% | 1381.54 | $247.29 | $160.00 | $160.00 | 0.00 | 153.504 | $27.48 | 5.82 |
| 1 | Office | 2080 | 3 | 2 | T8 1x4 2 Lamps Electronic Ballast Pendant Parabolic | 58 | 0.17 | 361.9 | $64.78 | 3 | 0 | Dual Technology Occupancy Sensor | 58 | 0.17 | 10% | 325.73 | $58.31 | $160.00 | $160.00 | 0.00 | 36.192 | $6.48 | 24.70 |
| 3 | Faculty Room | 2080 | 4 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.23 | 482.6 | $86.38 | 4 | 0 | Dual Technology Occupancy Sensor | 58 | 0.23 | 10% | 434.30 | $77.74 | $160.00 | $160.00 | 0.00 | 48.256 | $8.64 | 18.52 |
| 8 | Faculty Room | 2080 | 2 | 2 | 2'x2' 2-Lamp T-8 U-Tube, Prism Lens Electronic Ballast | 73 | 0.15 | 303.7 | $54.36 | 2 | 2 | Dual Technology Occupancy Sensor | 73 | 0.15 | 10% | 273.31 | $48.92 | $0.00 | $0.00 | 0.00 | 30.368 | $5.44 | 0.00 |
| 4 | Faculty Room | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | Dual Technology Occupancy Sensor | 82 | 0.98 | 10% | 1842.05 | $329.73 | $0.00 | $0.00 | 0.00 | 204.672 | $36.64 | 0.00 |
| 6 | Closet | 520 | 1 | 1 | Incandescent | 120 | 0.12 | 62.4 | $11.17 | 1 | 0 | No Change | 120 | 0.12 | 0% | 62.40 | $11.17 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 7 | Closet | 520 | 1 | 1 | Incandescent | 150 | 0.15 | 78.0 | $13.96 | 1 | 0 | No Change | 150 | 0.15 | 0% | 78.00 | $13.96 | $160.00 | $160.00 | 0.00 | 0 | $0.00 | 0.00 |
| 1 | Custodian Closet | 520 | 2 | 2 | T8 1x4 2 Lamps Electronic Ballast Pendant Parabolic | 58 | 0.12 | 60.3 | $10.80 | 2 | 0 | No Change | 58 | 0.12 | 0% | 60.32 | $10.80 | $160.00 | $160.00 | 0.00 | 0 | $0.00 | 0.00 |
| 5 | Custodian Closet | 520 | 1 | 1 | Incadescent | 100 | 0.10 | 52.0 | $9.31 | 1 | 0 | No Change | 100 | 0.10 | 0% | 52.00 | $9.31 | $160.00 | $160.00 | 0.00 | 0 | $0.00 | 0.00 |
| 10 | Stairwell | 8760 | 2 | 4 | 4' - 4 lamp T-8, Parabolic, Electronic Ballast | 109 | 0.22 | 1,909.7 | $341.83 | 2 | 3 | No Change | 109 | 0.22 | 0% | 1909.68 | $341.83 | $160.00 | $160.00 | 0.00 | 0 | $0.00 | 0.00 |
| 1 | Stairwell | 8760 | 1 | 2 | T8 1x4 2 Lamps Electronic Ballast Pendant Parabolic | 58 | 0.06 | 508.1 | $90.95 | 1 | 0 | No Change | 58 | 0.06 | 0% | 508.08 | $90.95 | $160.00 | $160.00 | 0.00 | 0 | $0.00 | 0.00 |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | Stairwell | 8760 | 6 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.49 | 4,309.9 | $771.48 | 6 | 0 | No Change | 82 | 0.49 | 0% | 4309.92 | $771.48 | $160.00 | $160.00 | 0.00 | 0 | $0.00 | 0.00 |
| 9 | Hallway | 8760 | 15 | 3 | 2'x2' 3-Lamp T-8 twin-Tube, Prism Lens Electronic Ballast | 108 | 1.62 | 14,191.2 | $2,540.22 | 15 | 2 | No Change | 108 | 1.62 | 0% | 14191.20 | $2,540.22 | $160.00 | $160.00 | 0.00 | 0 | $0.00 | 0.00 |
| 11 | Hallway | 8760 | 14 | 2 | High Hat - CFL | 26 | 0.36 | 3,188.6 | $570.77 | 14 | 2 | No Change | 26 | 0.36 | 0% | 3188.64 | $570.77 | $160.00 | $160.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Bathrooms | 2600 | 4 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.23 | 603.2 | $107.97 | 4 | 0 | Dual Technology Occupancy Sensor | 58 | 0.23 | 10% | 542.88 | $97.18 | $160.00 | $160.00 | 0.00 | 60.32 | $10.80 | 14.82 |
| 3 | Closets | 520 | 4 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.23 | 120.6 | $21.59 | 4 | 0 | No Change | 58 | 0.23 | 0% | 120.64 | $21.59 | $160.00 | $160.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Room 23 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | Dual Technology Occupancy Sensor | 82 | 0.98 | 10% | 1842.05 | $329.73 | $160.00 | $160.00 | 0.00 | 204.672 | $36.64 | 4.37 |
| 4 | Room 24 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | Dual Technology Occupancy Sensor | 82 | 0.98 | 10% | 1842.05 | $329.73 | $160.00 | $160.00 | 0.00 | 204.672 | $36.64 | 4.37 |
| 4 | Room 25 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | Dual Technology Occupancy Sensor | 82 | 0.98 | 10% | 1842.05 | $329.73 | $160.00 | $160.00 | 0.00 | 204.672 | $36.64 | 4.37 |
| 3 | Hallway | 8760 | 21 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 1.22 | 10,669.7 | $1,909.87 | 21 | 0 | No Change | 58 | 1.22 | 0% | 10669.68 | $1,909.87 | $160.00 | $160.00 | 0.00 | 0 | $0.00 | 0.00 |
| 12 | Hallway | 8760 | 3 | 6 | 4'x4' 6 lamp T8 Prism Lens Electronic Ballast | 167 | 0.50 | 4,388.8 | $785.59 | 3 | 6 | No Change | 167 | 0.50 | 0% | 4388.76 | $785.59 | $160.00 | $160.00 | 0.00 | 0 | $0.00 | 0.00 |
| 1 | Boiler Room | 2600 | 6 | 2 | T8 1x4 2 Lamps Electronic Ballast Pendant Parabolic | 58 | 0.35 | 904.8 | $161.96 | 6 | 0 | Dual Technology Occupancy Sensor | 58 | 0.35 | 10% | 814.32 | $145.76 | $160.00 | $160.00 | 0.00 | 90.48 | $16.20 | 9.88 |
| 7 | Boiler Room | 2080 | 1 | 1 | Incandescent | 150 | 0.15 | 312.0 | $55.85 | 1 | 0 | Dual Technology Occupancy Sensor | 150 | 0.15 | 10% | 280.80 | $50.26 | $160.00 | $160.00 | 0.00 | 31.2 | $5.58 | 28.65 |
| 3 | Closet | 520 | 1 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.06 | 30.2 | $5.40 | 1 | 0 | No Change | 58 | 0.06 | 0% | 30.16 | $5.40 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| 2 | Conference Room | 8760 | 4 | 3 | T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens | 82 | 0.33 | 2,873.3 | $514.32 | 4 | 0 | Dual Technology Occupancy Sensor | 82 | 0.33 | 10% | 2585.95 | $462.89 | $0.00 | $0.00 | 0.00 | 287.328 | $51.43 | 0.00 |
| 11 | Conference Room | 2080 | 3 | 2 | High Hat - CFL | 26 | 0.08 | 162.2 | $29.04 | 3 | 2 | Dual Technology Occupancy Sensor | 26 | 0.08 | 10% | 146.02 | $26.14 | $160.00 | $160.00 | 0.00 | 16.224 | $2.90 | 55.09 |
| 3 | Conference Room | 2080 | 1 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.06 | 120.6 | $21.59 | 1 | 0 | Dual Technology Occupancy Sensor | 58 | 0.06 | 10% | 108.58 | $19.44 | $160.00 | $160.00 | 0.00 | 12.064 | $2.16 | 74.09 |
| 1 | Conference Room | 2080 | 2 | 2 | T8 1x4 2 Lamps Electronic Ballast Pendant Parabolic | 58 | 0.12 | 241.3 | $43.19 | 2 | 0 | Dual Technology Occupancy Sensor | 58 | 0.12 | 10% | 217.15 | $38.87 | $160.00 | $160.00 | 0.00 | 24.128 | $4.32 | 37.05 |
| 2 | SG1 | 2080 | 14 | 3 | T8 1x4 3 Lamps Electronic Ballast Pendant Mounting Direct/Indirect Lens | 82 | 1.15 | 2,387.8 | $427.42 | 14 | 0 | Dual Technology Occupancy Sensor | 82 | 1.15 | 10% | 2149.06 | $384.68 | $160.00 | $160.00 | 0.00 | 238.784 | $42.74 | 3.74 |
| 4 | SG1 | 2080 | 2 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.16 | 341.1 | $61.06 | 2 | 0 | Dual Technology Occupancy Sensor | 82 | 0.16 | 10% | 307.01 | $54.95 | $0.00 | $0.00 | 0.00 | 34.112 | $6.11 | 0.00 |
| 3 | Bathrooms | 2600 | 4 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.23 | 603.2 | $107.97 | 4 | 0 | Dual Technology Occupancy Sensor | 58 | 0.23 | 10% | 542.88 | $97.18 | $160.00 | $160.00 | 0.00 | 60.32 | $10.80 | 14.82 |
| 4 | Room 22 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | Dual Technology Occupancy Sensor | 82 | 0.98 | 10% | 1842.05 | $329.73 | $160.00 | $160.00 | 0.00 | 204.672 | $36.64 | 4.37 |
| 4 | Room 21 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | Dual Technology Occupancy Sensor | 82 | 0.98 | 10% | 1842.05 | $329.73 | $160.00 | $160.00 | 0.00 | 204.672 | $36.64 | 4.37 |
| 4 | Room 20 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | Dual Technology Occupancy Sensor | 82 | 0.98 | 10% | 1842.05 | $329.73 | $160.00 | $160.00 | 0.00 | 204.672 | $36.64 | 4.37 |
| 4 | Room 19 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | Dual Technology Occupancy Sensor | 82 | 0.98 | 10% | 1842.05 | $329.73 | $160.00 | $160.00 | 0.00 | 204.672 | $36.64 | 4.37 |
| 12 | Library Conference Rm | 2080 | 4 | 6 | 4'x4' 6 lamp T8 Prism Lens Electronic Ballast | 167 | 0.67 | 1,389.4 | $248.71 | 4 | 6 | Dual Technology Occupancy Sensor | 167 | 0.67 | 10% | 1250.50 | $223.84 | $160.00 | $160.00 | 0.00 | 138.944 | $24.87 | 6.43 |
| 8 | Library | 2080 | 16 | 2 | 2'x2' 2-Lamp T-8 U-Tube, Prism Lens Electronic Ballast | 73 | 1.17 | 2,429.4 | $434.87 | 16 | 2 | Dual Technology Occupancy Sensor | 73 | 1.17 | 10% | 2186.50 | $391.38 | $0.00 | $0.00 | 0.00 | 242.944 | $43.49 | 0.00 |
| 4 | Library | 2080 | 24 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 1.97 | 4,093.4 | $732.73 | 24 | 0 | Dual Technology Occupancy Sensor | 82 | 1.97 | 10% | 3684.10 | $659.45 | $160.00 | $160.00 | 0.00 | 409.344 | $73.27 | 2.18 |
| 11 | Library | 2080 | 15 | 2 | High Hat - CFL | 26 | 0.39 | 811.2 | $145.20 | 15 | 2 | Dual Technology Occupancy Sensor | 26 | 0.39 | 10% | 730.08 | $130.68 | $160.00 | $160.00 | 0.00 | 81.12 | $14.52 | 11.02 |
| 9 | Boys Room | 2600 | 5 | 3 | 2'x2' 3-Lamp T-8 twin-Tube, Prism Lens Electronic Ballast | 108 | 0.54 | 1,404.0 | $251.32 | 5 | 2 | Dual Technology Occupancy Sensor | 108 | 0.54 | 10% | 1263.60 | $226.18 | $160.00 | $160.00 | 0.00 | 140.4 | $25.13 | 6.37 |
| 9 | Girls Room | 2600 | 5 | 3 | 2'x2' 3-Lamp T-8 twin-Tube, Prism Lens Electronic Ballast | 108 | 0.54 | 1,404.0 | $251.32 | 5 | 2 | Dual Technology Occupancy Sensor | 108 | 0.54 | 10% | 1263.60 | $226.18 | $160.00 | $160.00 | 0.00 | 140.4 | $25.13 | 6.37 |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | Room 33 | 2080 | 15 | 15 | 1'x20' 3 lamp/4' T8 electronic Ballast direct/indirect | 410 | 6.15 | 12,792.0 | $2,289.77 | 15 | 15 | Dual Technology Occupancy Sensor | 410 | 6.15 | 10% | 11512.80 | $2,060.79 | $160.00 | $160.00 | 0.00 | 1279.2 | $228.98 | 0.70 |
| 13 | Room 31 | 2080 | 15 | 15 | 1'x20' 3 lamp/4' T8 electronic Ballast direct/indirect | 410 | 6.15 | 12,792.0 | $2,289.77 | 15 | 15 | Dual Technology Occupancy Sensor | 410 | 6.15 | 10% | 11512.80 | $2,060.79 | $160.00 | $160.00 | 0.00 | 1279.2 | $228.98 | 0.70 |
| 4 | Room 10 | 2080 | 10 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.82 | 1,705.6 | $305.30 | 10 | 0 | Dual Technology Occupancy Sensor | 82 | 0.82 | 10% | 1535.04 | $274.77 | $160.00 | $160.00 | 0.00 | 170.56 | $30.53 | 5.24 |
| 4 | Room 11 | 2080 | 10 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.82 | 1,705.6 | $305.30 | 10 | 0 | Dual Technology Occupancy Sensor | 82 | 0.82 | 10% | 1535.04 | $274.77 | $160.00 | $160.00 | 0.00 | 170.56 | $30.53 | 5.24 |
| 3 | Boys Room | 2600 | 3 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.17 | 452.4 | $80.98 | 3 | 0 | Dual Technology Occupancy Sensor | 58 | 0.17 | 10% | 407.16 | $72.88 | $160.00 | $160.00 | 0.00 | 45.24 | $8.10 | 19.76 |
| 3 | Girls Room | 2600 | 3 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.17 | 452.4 | $80.98 | 3 | 0 | Dual Technology Occupancy Sensor | 58 | 0.17 | 10% | 407.16 | $72.88 | $160.00 | $160.00 | 0.00 | 45.24 | $8.10 | 19.76 |
| 3 | Custodial Closet | 520 | 1 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.06 | 30.2 | $5.40 | 1 | 0 | No Change | 58 | 0.06 | 0% | 30.16 | $5.40 | $160.00 | $160.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Room 12 | 2080 | 10 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.58 | 1,206.4 | $215.95 | 10 | 0 | Dual Technology Occupancy Sensor | 58 | 0.58 | 10% | 1085.76 | $194.35 | $160.00 | $160.00 | 0.00 | 120.64 | $21.59 | 7.41 |
| 4 | Room 13 | 2080 | 10 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.82 | 1,705.6 | $305.30 | 10 | 0 | Dual Technology Occupancy Sensor | 82 | 0.82 | 10% | 1535.04 | $274.77 | $160.00 | $160.00 | 0.00 | 170.56 | $30.53 | 5.24 |
| 4 | Room 14 | 2080 | 10 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.82 | 1,705.6 | $305.30 | 10 | 0 | Dual Technology Occupancy Sensor | 82 | 0.82 | 10% | 1535.04 | $274.77 | $160.00 | $160.00 | 0.00 | 170.56 | $30.53 | 5.24 |
| 8 | Room 15 | 2080 | 16 | 2 | 2'x2' 2-Lamp T-8 U-Tube, Prism Lens Electronic Ballast | 73 | 1.17 | 2,429.4 | $434.87 | 16 | 2 | Dual Technology Occupancy Sensor | 73 | 1.17 | 10% | 2186.50 | $391.38 | $0.00 | $0.00 | 0.00 | 242.944 | $43.49 | 0.00 |
| 4 | Room 15 | 2080 | 2 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.16 | 341.1 | $61.06 | 2 | 0 | Dual Technology Occupancy Sensor | 82 | 0.16 | 10% | 307.01 | $54.95 | $160.00 | $160.00 | 0.00 | 34.112 | $6.11 | 26.20 |
| 3 | Boys Room | 2600 | 2 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.12 | 301.6 | $53.99 | 2 | 0 | Dual Technology Occupancy Sensor | 58 | 0.12 | 10% | 271.44 | $48.59 | $160.00 | $160.00 | 0.00 | 30.16 | $5.40 | 29.64 |
| 3 | Girls Room | 2600 | 3 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.17 | 452.4 | $80.98 | 3 | 0 | Dual Technology Occupancy Sensor | 58 | 0.17 | 10% | 407.16 | $72.88 | $0.00 | $0.00 | 0.00 | 45.24 | $8.10 | 0.00 |
| 13 | Room 15 | 2080 | 15 | 15 | 1'x20' 3 lamp/4' T8 electronic Ballast direct/indirect | 410 | 6.15 | 12,792.0 | $2,289.77 | 15 | 15 | Dual Technology Occupancy Sensor | 410 | 6.15 | 10% | 11512.80 | $2,060.79 | $160.00 | $160.00 | 0.00 | 1279.2 | $228.98 | 0.70 |
| 5 | Restroom | 2600 | 1 | 1 | Incadescent | 100 | 0.10 | 260.0 | $46.54 | 1 | 0 | Dual Technology Occupancy Sensor | 100 | 0.10 | 10% | 234.00 | $41.89 | $160.00 | $160.00 | 0.00 | 26 | $4.65 | 34.38 |
| 18 | Gym | 2080 | 18 | 1 | Metal Halide -High-Bay Fixture | 292 | 5.26 | 10,932.5 | $1,956.91 | 18 | 0 | Dual Technology Occupancy Sensor | 292 | 5.26 | 10% | 9839.23 | $1,761.22 | $160.00 | $160.00 | 0.00 | 1093.248 | $195.69 | 0.82 |
| 4 | Cafeteria | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | Dual Technology Occupancy Sensor | 82 | 0.98 | 10% | 1842.05 | $329.73 | $160.00 | $160.00 | 0.00 | 204.672 | $36.64 | 4.37 |
| 14 | Cafeteria | 2080 | 15 | 4 | 2x4 4 lamp T-8 | 128 | 1.92 | 3,993.6 | $714.85 | 15 | 4 | Dual Technology Occupancy Sensor | 128 | 1.92 | 10% | 3594.24 | $643.37 | $160.00 | $160.00 | 0.00 | 399.36 | $71.49 | 2.24 |
| 4 | Music Tech | 2080 | 16 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 1.31 | 2,729.0 | $488.48 | 16 | 0 | Dual Technology Occupancy Sensor | 82 | 1.31 | 10% | 2456.06 | $439.64 | $160.00 | $160.00 | 0.00 | 272.896 | $48.85 | 3.28 |
| 15 | Kitchen | 2080 | 2 | 2 | 1'x8' 2-Lamp 75T12 Prismatic Lens Magnetic | 158 | 0.32 | 657.3 | $117.65 | 2 | 4 | Dual Technology Occupancy Sensor | 158 | 0.32 | 10% | 591.55 | $105.89 | $160.00 | $160.00 | 0.00 | 65.728 | $11.77 | 13.60 |
| 16 | Kitchen | 2080 | 2 | 1 | 4' - 1 lamp T-12, No Lens, Magnetic Ballast | 57 | 0.11 | 237.1 | $42.44 | 2 | 0 | Dual Technology Occupancy Sensor | 57 | 0.11 | 10% | 213.41 | $38.20 | $160.00 | $160.00 | 0.00 | 23.712 | $4.24 | 37.70 |
| 3 | Hallway | 8760 | 13 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.75 | 6,605.0 | $1,182.30 | 13 | 0 | No Change | 58 | 0.75 | 0% | 6605.04 | $1,182.30 | $160.00 | $160.00 | 0.00 | 0 | $0.00 | 0.00 |
| 8 | Hallway | 8760 | 1 | 2 | 2'x2' 2-Lamp T-8 U-Tube, Prism Lens Electronic Ballast | 73 | 0.07 | 639.5 | $114.47 | 1 | 2 | No Change | 73 | 0.07 | 0% | 639.48 | $114.47 | $160.00 | $160.00 | 0.00 | 0 | $0.00 | 0.00 |
| 3 | Hallway | 8760 | 20 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 1.16 | 10,161.6 | $1,818.93 | 20 | 0 | No Change | 58 | 1.16 | 0% | 10161.60 | $1,818.93 | $160.00 | $160.00 | 0.00 | 0 | $0.00 | 0.00 |
| 11 | Hallway | 8760 | 2 | 2 | High Hat - CFL | 26 | 0.05 | 455.5 | $81.54 | 2 | 2 | No Change | 26 | 0.05 | 0% | 455.52 | $81.54 | $160.00 | $160.00 | 0.00 | 0 | $0.00 | 0.00 |
| 4 | Room 28 | 2080 | 8 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.66 | 1,364.5 | $244.24 | 8 | 0 | Dual Technology Occupancy Sensor | 82 | 0.66 | 10% | 1228.03 | $219.82 | $0.00 | $0.00 | 0.00 | 136.448 | $24.42 | 0.00 |
| 4 | Room 27 | 2080 | 8 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.66 | 1,364.5 | $244.24 | 8 | 0 | Dual Technology Occupancy Sensor | 82 | 0.66 | 10% | 1228.03 | $219.82 | $0.00 | $0.00 | 0.00 | 136.448 | $24.42 | 0.00 |
| 4 | Room 26 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | Dual Technology Occupancy Sensor | 82 | 0.98 | 10% | 1842.05 | $329.73 | $0.00 | $0.00 | 0.00 | 204.672 | $36.64 | 0.00 |
| 3 | Hallway | 8760 | 14 | 2 | T8 2x4 2 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 58 | 0.81 | 7,113.1 | $1,273.25 | 14 | 0 | No Change | 58 | 0.81 | 0% | 7113.12 | $1,273.25 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | Offices | 2080 | 22 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 1.80 | 3,752.3 | $671.67 | 22 | 0 | Dual Technology Occupancy Sensor | 82 | 1.80 | 10% | 3377.09 | $604.50 | $160.00 | $160.00 | 0.00 | 375.232 | $67.17 | 2.38 |
| 17 | Custodial Closet | 520 | 1 | 2 | 1'x4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N GC | 58 | 0.06 | 30.2 | $5.40 | 1 | 2 | Dual Technology Occupancy Sensor | 58 | 0.06 | 10% | 27.14 | $4.86 | $160.00 | $160.00 | 0.00 | 3.016 | $0.54 | 296.37 |
| 4 | Room 16 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | Dual Technology Occupancy Sensor | 82 | 0.98 | 10% | 1842.05 | $329.73 | $160.00 | $160.00 | 0.00 | 204.672 | $36.64 | 4.37 |
| 4 | Room 17 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | Dual Technology Occupancy Sensor | 82 | 0.98 | 10% | 1842.05 | $329.73 | $160.00 | $160.00 | 0.00 | 204.672 | $36.64 | 4.37 |
| 4 | Room 18 | 2080 | 12 | 3 | T8 2x4 3 Lamps Electronic Ballast Recessed Mounting Prismatic Lens | 82 | 0.98 | 2,046.7 | $366.36 | 12 | 0 | Dual Technology Occupancy Sensor | 82 | 0.98 | 10% | 1842.05 | $329.73 | $160.00 | $160.00 | 0.00 | 204.672 | $36.64 | 4.37 |
| 19 | Throughout | 8760 | 25 | 0 | Exit Sign - LED | 4 | 0.10 | 876.0 | $156.80 | 25 | 0 | No Change | 4 | 0.10 | 0% | 876.00 | $156.80 | $0.00 | $0.00 | 0.00 | 0 | $0.00 | 0.00 |
| | **Totals** | | 830 | 265 | | | 79.69 | 217,337.0 | $38,903.32 | 830 | 92 | | | 79.686 | | 202,153.50 | $36,185.48 | | $11,200.00 | 0.00 | 15183.5 | $2,717.84 | 4.12 |

**NOTES:** 1. Simple Payback noted in this spreadsheet does not include Maintenance Savings and NJ Smart Start Incentives.

**CEG Job #:** 9C09078
**Project:** Chatham School District
**Address:** 221 Lafayette Avenue
**City:** Chatham
**Building SF:** 75,268

# Lafayette School

**DATE:** 11/3/2009
**KWH COST:** **$0.179**

## ECM #3: Lighting Upgrade - Gym

| EXISTING LIGHTING | | | | | | | | | | PROPOSED LIGHTING | | | | | | | | SAVINGS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CEG Type | Fixture Location | Yearly Usage | No. Fixts | No. Lamps | Fixture Type | Fixt Watts | Total kW | kWh/Yr Fixtures | Yearly $ Cost | No. Fixts | No. Lamps | Retro-Unit Description | Watts Used | Total kW | kWh/Yr Fixtures | Yearly $ Cost | Unit Cost (INSTALLED) | Total Cost | kW Savings | kWh/Yr Savings | Yearly $ Savings | Yearly Simple Payback |
| 18 | Gym | 2080 | 18 | 1 | Metal Halide -High-Bay Fixture | 292 | 5.26 | 10,932.5 | $1,956.91 | 18 | 3 | 3-Lamp T-5 HO Cooper F-Bay | 182 | 3.28 | 6814.08 | $1,219.72 | $300.00 | $5,400.00 | 1.98 | 4118.4 | $737.19 | 7.33 |
| | **Totals** | | 18 | 1 | | | 5.26 | 10,932.5 | $1,956.91 | 18 | 3 | | | 3.276 | 6814.08 | $1,219.72 | | $5,400.00 | 1.98 | 4118.4 | $737.19 | 7.33 |

**NOTES:** 1. Simple Payback noted in this spreadsheet does not include Maintenance Savings and NJ Smart Start Incentives.

**Project Name:** LGEA Solar PV Project - Lafayette Avenue School
**Location:** Chatham, NJ
**Description:** Photovoltaic System 95% Financing - 25 year

**Simple Payback Analysis**

| | Photovoltaic System 95% Financing - 25 year |
|---|---|
| Total Construction Cost | $904,590 |
| Annual kWh Production | 125,300 |
| Annual Energy Cost Reduction | $22,429 |
| Annual SREC Revenue | $43,855 |
| First Cost Premium | **$904,590** |
| Simple Payback: | **13.65** Years |

**Life Cycle Cost Analysis**

| | | | |
|---|---|---|---|
| Analysis Period (years): | 25 | Financing %: | 95% |
| Financing Term (mths): | 240 | Maintenance Escalation Rate: | 3.0% |
| Average Energy Cost ($/kWh) | **$0.179** | Energy Cost Escalation Rate: | 3.0% |
| Financing Rate: | 7.00% | SREC Value ($/kWh) | $0.350 |

| Period | Additional Cash Outlay | Energy kWh Production | Energy Cost Savings | Additional Maint Costs | SREC Revenue | Interest Expense | Loan Principal | Net Cash Flow | Cumulative Cash Flow |
|---|---|---|---|---|---|---|---|---|---|
| 0 | $45,230 | 0 | 0 | 0 | $0 | 0 | 0 | (45,230) | 0 |
| 1 | $0 | 125,300 | $22,429 | $0 | $43,855 | $59,508 | $20,444 | ($13,668) | ($58,897) |
| 2 | $0 | 124,674 | $23,102 | $0 | $43,636 | $58,030 | $21,922 | ($13,214) | ($72,111) |
| 3 | $0 | 124,050 | $23,795 | $0 | $43,418 | $56,445 | $23,506 | ($12,739) | ($84,850) |
| 4 | $0 | 123,430 | $24,508 | $0 | $43,200 | $54,746 | $25,206 | ($12,242) | ($97,093) |
| 5 | $0 | 122,813 | $25,244 | $1,265 | $42,984 | $52,924 | $27,028 | ($12,988) | ($110,081) |
| 6 | $0 | 122,199 | $26,001 | $1,259 | $42,770 | $50,970 | $28,982 | ($12,439) | ($122,520) |
| 7 | $0 | 121,588 | $26,781 | $1,252 | $42,556 | $48,875 | $31,077 | ($11,867) | ($134,387) |
| 8 | $0 | 120,980 | $27,584 | $1,246 | $42,343 | $46,628 | $33,323 | ($11,270) | ($145,658) |
| 9 | $0 | 120,375 | $28,412 | $1,240 | $42,131 | $44,219 | $35,732 | ($10,648) | ($156,306) |
| 10 | $0 | 119,773 | $29,264 | $1,234 | $41,921 | $41,636 | $38,315 | ($10,000) | ($166,306) |
| 11 | $0 | 119,174 | $30,142 | $1,227 | $41,711 | $38,866 | $41,085 | ($9,326) | ($175,631) |
| 12 | $0 | 118,578 | $31,047 | $1,221 | $41,502 | $35,896 | $44,055 | ($8,624) | ($184,255) |
| 13 | $0 | 117,985 | $31,978 | $1,215 | $41,295 | $32,712 | $47,240 | ($7,894) | ($192,149) |
| 14 | $0 | 117,395 | $32,937 | $1,209 | $41,088 | $29,297 | $50,655 | ($7,135) | ($199,284) |
| 15 | $0 | 116,808 | $33,925 | $1,203 | $40,883 | $25,635 | $54,317 | ($6,346) | ($205,630) |
| 16 | $0 | 116,224 | $34,943 | $1,197 | $40,679 | $21,708 | $58,243 | ($5,527) | ($211,156) |
| 17 | $0 | 115,643 | $35,991 | $1,191 | $40,475 | $17,498 | $62,454 | ($4,676) | ($215,832) |
| 18 | $0 | 115,065 | $37,071 | $1,185 | $40,273 | $12,983 | $66,968 | ($3,793) | ($219,625) |
| 19 | $0 | 114,490 | $38,183 | $1,179 | $40,071 | $8,142 | $71,810 | ($2,876) | ($222,501) |
| 20 | $0 | 113,917 | $39,329 | $1,173 | $39,871 | $2,951 | $77,001 | ($1,925) | ($224,426) |
| 21 | $0 | 113,348 | $40,509 | $1,167 | $39,672 | $2,502 | $70,787 | $5,724 | ($218,701) |
| 22 | $0 | 112,781 | $41,724 | $1,162 | $39,473 | $1,712 | $58,251 | $20,072 | ($198,629) |
| 23 | $0 | 112,217 | $42,976 | $1,156 | $39,276 | $0 | $0 | $81,096 | ($117,533) |
| 24 | $0 | 111,656 | $44,265 | $1,150 | $39,080 | $0 | $0 | $82,195 | ($35,339) |
| 25 | $0 | 111,098 | $45,593 | $1,144 | $38,884 | $0 | $0 | $83,333 | $47,994 |
| | **Totals:** | 2,951,561 | $0 | $25,277 | $1,033,046 | $743,880 | $988,399 | $93,224 | ($3,720,906) |
| | | | | **Net Present Value (NPV)** | | | **($86,839)** | | |
| | | | | **Internal Rate of Return (IRR)** | | | **1.1%** | | |

**Project Name: LGEA Solar PV Project - Lafayette Avenue School**
**Location: Chatham, NJ**
**Description: Photovoltaic System - Direct Purchase**

**Simple Payback Analysis**

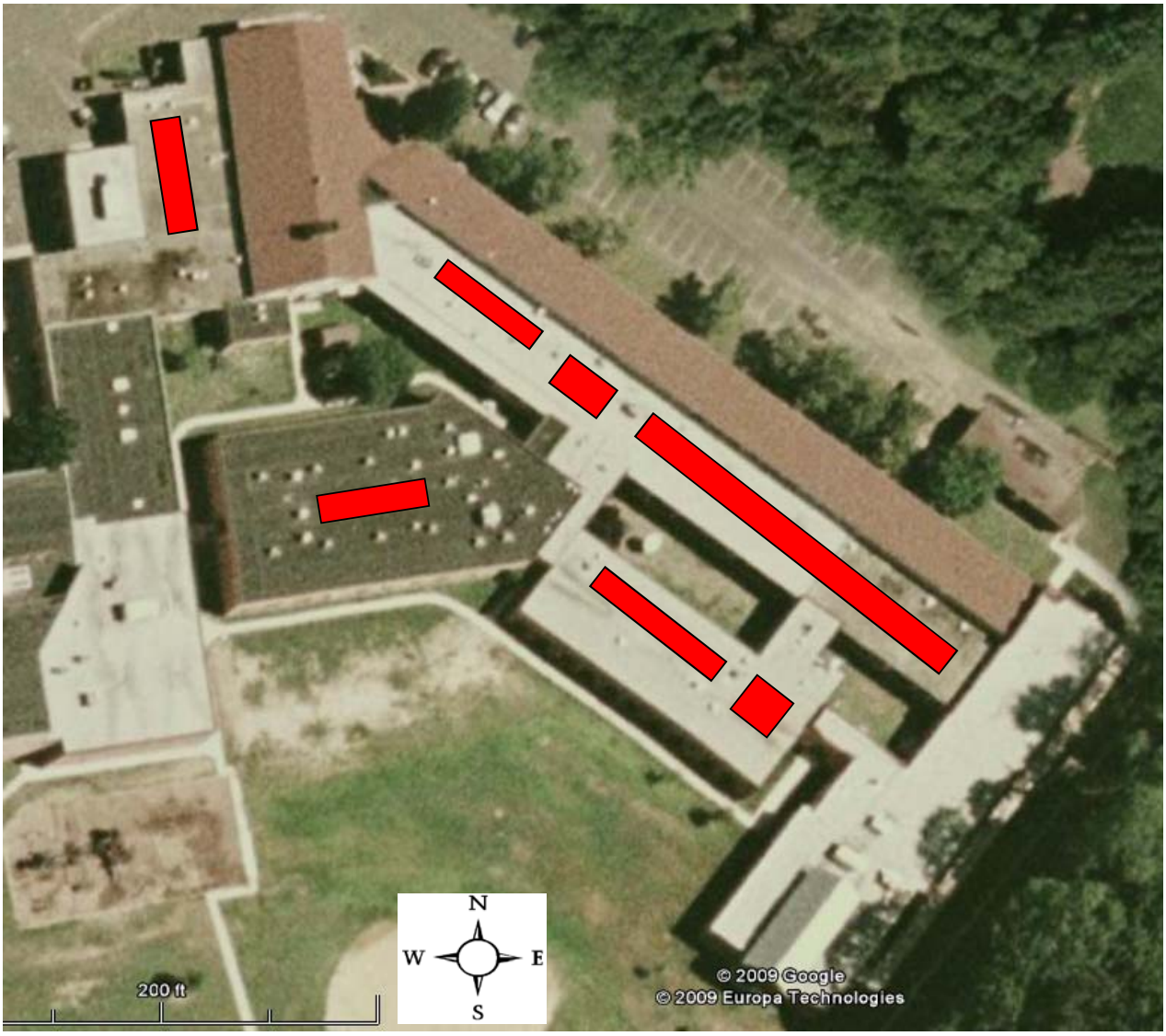
| | Photovoltaic System - Direct Purchase |
|---|---|
| Total Construction Cost | $904,590 |
| Annual kWh Production | 125,300 |
| Annual Energy Cost Reduction | $22,429 |
| Annual SREC Revenue | $43,855 |
| First Cost Premium | **$904,590** |
| Simple Payback: | **13.65** **Years** |

**Life Cycle Cost Analysis**

| | | | |
|---|---|---|---|
| Analysis Period (years): | 25 | Financing %: | 0% |
| Financing Term (mths): | 0 | Maintenance Escalation Rate: | 3.0% |
| Average Energy Cost ($/kWh) | **$0.179** | Energy Cost Escalation Rate: | 3.0% |
| Financing Rate: | 0.00% | SREC Value ($/kWh) | $0.350 |

| Period | Additional Cash Outlay | Energy kWh Production | Energy Cost Savings | Additional Maint Costs | SREC Revenue | Net Cash Flow | Cumulative Cash Flow |
|---|---|---|---|---|---|---|---|
| 0 | $904,590 | 0 | 0 | 0 | $0 | (904,590) | 0 |
| 1 | $0 | 125,300 | $22,429 | $0 | $43,855 | $66,284 | ($838,306) |
| 2 | $0 | 124,674 | $23,102 | $0 | $43,636 | $66,737 | ($771,569) |
| 3 | $0 | 124,050 | $23,795 | $0 | $43,418 | $67,212 | ($704,357) |
| 4 | $0 | 123,430 | $24,508 | $0 | $43,200 | $67,709 | ($636,648) |
| 5 | $0 | 122,813 | $25,244 | $1,265 | $42,984 | $66,963 | ($569,685) |
| 6 | $0 | 122,199 | $26,001 | $1,259 | $42,770 | $67,512 | ($502,173) |
| 7 | $0 | 121,588 | $26,781 | $1,252 | $42,556 | $68,084 | ($434,088) |
| 8 | $0 | 120,980 | $27,584 | $1,246 | $42,343 | $68,681 | ($365,407) |
| 9 | $0 | 120,375 | $28,412 | $1,240 | $42,131 | $69,303 | ($296,104) |
| 10 | $0 | 119,773 | $29,264 | $1,234 | $41,921 | $69,951 | ($226,153) |
| 11 | $0 | 119,174 | $30,142 | $1,227 | $41,711 | $70,626 | ($155,527) |
| 12 | $0 | 118,578 | $31,047 | $1,221 | $41,502 | $71,328 | ($84,199) |
| 13 | $0 | 117,985 | $31,978 | $1,215 | $41,295 | $72,058 | ($12,142) |
| 14 | $0 | 117,395 | $32,937 | $1,209 | $41,088 | $72,817 | $60,675 |
| 15 | $0 | 116,808 | $33,925 | $1,203 | $40,883 | $73,605 | $134,280 |
| 16 | $0 | 116,224 | $34,943 | $1,197 | $40,679 | $74,425 | $208,705 |
| 17 | $0 | 115,643 | $35,991 | $1,191 | $40,475 | $75,275 | $283,980 |
| 18 | $0 | 115,065 | $37,071 | $1,185 | $40,273 | $76,159 | $360,139 |
| 19 | $0 | 114,490 | $38,183 | $1,179 | $40,071 | $77,076 | $437,215 |
| 20 | $0 | 113,917 | $39,329 | $1,173 | $39,871 | $78,027 | $515,241 |
| 21 | $1 | 113,348 | $40,509 | $1,167 | $39,672 | $79,013 | $594,254 |
| 22 | $2 | 112,781 | $41,724 | $1,162 | $39,473 | $80,036 | $674,290 |
| 23 | $3 | 112,217 | $42,976 | $1,156 | $39,276 | $81,096 | $755,386 |
| 24 | $4 | 111,656 | $44,265 | $1,150 | $39,080 | $82,195 | $837,580 |
| 25 | $5 | 111,098 | $45,593 | $1,144 | $38,884 | $83,333 | $920,913 |
| | **Totals:** | 2,951,561 | $817,734 | $25,277 | $1,033,046 | $1,825,503 | $186,298 |
| | | | | **Net Present Value (NPV)** | | **$920,938** | |
| | | | | **Internal Rate of Return (IRR)** | | **6.0%** | |

| Building | Roof Area (sq ft) | Panel | Qty | Panel Sq Ft | Panel Total Sq Ft | Total KW | Total Annual kWh | Panel Weight (33 lbs) | W/SQFT |
|---|---|---|---|---|---|---|---|---|---|
| Lafayette | 6422 | Sunpower SPR230 | 437 | 14.7 | 6,426 | 100.51 | 125,300 | 14,421 | 15.64 |




.= Proposed PV Layout

Notes:

1. Estimated kWH based on the National Renewable Energy Laboratory PVWatts Version 1 Calculator Program.

**PVWatts Version 1 Input Screen**

**PV System Specifications:**

| | | |
|---|---|---|
| DC Rating (kW): | 100.51 | Inputted From Roof Space Cell "G2" Total KW |
| DC to AC Derate Factor: | 0.81 | Inputted From Derate Factor Calculated Below in Cell "B37" |
| Array Type: | Fixed Tilt<br>1 - Axis Tracking<br>2 - Axis Tracking | There are 3 inputs for Array Type in all cases you should be using **Fixed Tilt** as the Selection |
| Fixed Tilt of Single Axis Tracking System: | | |
| Array Tilt (degrees): | 10 | Based on Roof Type: For Flat Roof use 10 degrees, For Pitched Roof this is based on roof pitch. |
| Array Azimuth (degrees): | 180 | Based on Direction Array is Facing. |

| **PV Watts Derate Factor for AC Power Rating at STC** | | |
|---|---|---|
| Component Derate Factors | PVWatts Default | Range |
| PV module nameplate DC rating | 1.00 | 0.80–1.05 |
| Inverter and transformer | 0.95 | 0.88–0.96 |
| Mismatch | 0.98 | 0.97–0.995 |
| Diodes and connections | 1.00 | 0.99–0.997 |
| DC wiring | 0.98 | 0.97–0.99 |
| AC wiring | 0.99 | 0.98–0.993 |
| Soiling | 0.95 | 0.30–0.995 |
| System availability | 0.95 | 0.00–0.995 |
| Shading | 1.00 | 0.00–1.00 |
| Sun-tracking | 1.00 | 0.95–1.00 |
| Age | 1.00 | 0.70–1.00 |
| Overall DC-to-AC derate factor | **0.81** | 0.96001–0.09999 |

Click on **Calculate** if default values are acceptable, or after selecting your system specifications. Click on **Help** for information about system specifications. To use a DC to AC derate factor other than the default, click on **Derate Factor Help** for information.

**Station Identification:**

| | |
|---|---|
| WBAN Number: | 14734 |
| City: | Newark |
| State: | New_Jersey |

**PV System Specifications:**

DC Rating (kW): 100.51

DC to AC Derate Factor: .81 (Derate Factor Help)

Array Type: Fixed Tilt

Fixed Tilt or 1-Axis Tracking System:

Array Tilt (degrees): 40.7 (Default = Latitude)

Array Azimuth (degrees): 180.0 (Default = South)

**Energy Data:**

Cost of Electricity (cents/kWh): .179

Calculate HELP Reset Form

# PVWatts * * * AC Energy & Cost Savings

Cautions for Interpreting the Results

| Station Identification | |
|---|---|
| City: | Newark |
| State: | New_Jersey |
| Latitude: | 40.70° N |
| Longitude: | 74.17° W |
| Elevation: | 9 m |
| **PV System Specifications** | |
| DC Rating: | 100.5 kW |
| DC to AC Derate Factor: | 0.810 |
| AC Rating: | 81.4 kW |
| Array Type: | Fixed Tilt |
| Array Tilt: | 40.7° |
| Array Azimuth: | 180.0° |
| **Energy Specifications** | |
| Cost of Electricity: | 0.2 ¢/kWh |

| Results | | | |
|---|---|---|---|
| Month | Solar Radiation (kWh/m$^2$/day) | AC Energy (kWh) | Energy Value ($) |
| 1 | 3.36 | 8767 | 15.69 |
| 2 | 4.05 | 9463 | 16.94 |
| 3 | 4.58 | 11476 | 20.54 |
| 4 | 4.84 | 11221 | 20.09 |
| 5 | 5.30 | 12367 | 22.14 |
| 6 | 5.33 | 11673 | 20.89 |
| 7 | 5.27 | 11788 | 21.10 |
| 8 | 5.25 | 11659 | 20.87 |
| 9 | 5.06 | 11303 | 20.23 |
| 10 | 4.46 | 10646 | 19.06 |
| 11 | 3.15 | 7603 | 13.61 |
| 12 | 2.87 | 7335 | 13.13 |
| Year | 4.46 | 125300 | 224.29 |

Output Hourly Performance Data * Output Results as Text

About the Hourly Performance Data — Saving Text from a Browser

Run PVWATTS v.1 for another US location or an International location
Run PVWATTS v.2 (US only)

Please send questions and comments regarding PVWATTS to Webmaster

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