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**Local Government Energy Program
Energy Audit Report**

**Anderson Building
Unitarian Society of Ridgewood
113 Cottage Place
Ridgewood, NJ 07450**

Project Number: LGEA113



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EXECUTIVE SUMMARY

The Unitarian Society of Ridgewood Anderson Building is a two-story 8,252-ft² facility with a basement level. The major spaces within the building are the Anderson Auditorium, the Fellowship Room, commercial kitchen, youth room, classrooms, and nursery. The building was originally built in the late 1960s but underwent a major renovation in 1996 at which time the building was enlarged and a majority of the mechanical equipment was installed.

The following table provides a comparison of the current building energy usage based on the period from November 2013 through October 2014 for electricity and natural gas with the proposed energy usage resulting from the installation of recommended Energy Conservation Measures (ECMs) excluding any renewable energy.

Table 1: State of Building—Energy Usage

	Electric Usage (kWh/yr)	Gas Usage (therms/yr)	Current Annual Cost of Energy (\$)	Site Energy Use Intensity (kBtu/sq ft /yr)	Source Energy Use Intensity (kBtu/sq ft /yr)	Joint Energy Consumption (MMBtu/yr)
Current	57,930	4,489	\$16,427	78.4	137	647
Proposed	51,745	3,572	\$14,186	64.7	117	534
Savings	6,185	917	\$2,241	13.7	20	113
% Savings	10.7%	20.4%	13.6%	17.4%	14.7%	17.4%

SWA has entered energy information about the Anderson Building into the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® Portfolio Manager Energy Benchmarking system. This facility is categorized as a "Worship Facility" space type. The ENERGY STAR® Energy Performance Rating was calculated to be 41. The Site Energy Utilization Intensity (Site EUI) was calculated to be 78.9 kBtu/ft²/yr compared to the National Median of 71.8 kBtu/ft²/yr. See the ECM section for guidance on how to reduce the building's energy intensity.

Recommendations

Based on the current state of the building and its energy use, SWA recommends implementing the following Energy Conservation Measures:

Recommended ECMs	Incentive Program (APPENDIX G for Details)
Install Insulation and Fill in Ventilation Structure in Anderson Hall	N/A
Install Low-Flow Aerators on All Building Faucets	N/A
Install Insulation on Hot Water Supply and Return for AHU 2	N/A
Install Weather-Stripping and Door Sweeps on the Front Doors	N/A
Replace High Pressure Sodium, Incandescent and Fluorescent Lamps with LED	SmartStart

Appendix H contains an Energy Conservation Measures table.

Capital Improvements are recommendations for the building that may not be cost-effective at the current time, but that could yield a significant long-term payback. Capital improvements may also constitute equipment that is currently being operated beyond its useful lifetime. These recommendations should typically be considered as part of a long-term capital improvement plan. Capital improvements should be considered if additional funds are made available, or if the installed costs can be shared with other improvements, such as major building renovations. SWA recommends the following Capital Improvement measure to reduce energy usage:

- Replace the Existing Boilers with New Gas Fired Boilers
- Replace the Split AC Units with New High Efficiency Split AC Units

In addition to these ECMs, SWA recommends the following Operation and Maintenance (O&M) measures that would contribute to reducing energy usage at low or no cost:

- Purchase Energy Star® Appliances

There may be energy procurement opportunities for the Anderson Building to reduce annual utility costs. The building currently pays a higher than average utility rate for gas, and should be able to further reduce utility costs. SWA recommends further evaluation with energy suppliers, listed in Appendix D.

Energy Conservation Measure Implementation

The following table shows an estimated implementation timeline for the recommended ECMs at the Anderson Building.

Table 2: Estimated Energy Conservation Timeline

Est. Implementation Timeline	Savings (\$)	Simple Payback Period	Initial Investment (\$)	CO2 Savings (lbs/yr)
0-5 Year	\$2,241	1.8	\$4,084	21,183
5-10 Year	N/A	N/A	N/A	N/A
>10 year	N/A	N/A	N/A	N/A
Total	\$2,241	1.8	\$4,084	21,183

Environmental Benefits

SWA estimates that implementing the recommended ECMs is equivalent to removing approximately 2 cars from the roads each year or is equivalent of planting 52 trees to absorb CO² from the atmosphere.

INTRODUCTION

Launched in 2008, the Local Government Energy Audit (LGEA) Program provides subsidized energy audits for municipal and local government-owned facilities, including offices, courtrooms, town halls, police and fire stations, sanitation buildings, transportation structures, schools and community centers. The Program will subsidize up to 100% of the cost of the audit. The Board of Public Utilities (BPU) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

Steven Winter Associates, Inc. (SWA) is a 40-year-old architectural/engineering research and consulting firm, with specialized expertise in green technologies and procedures that improve the safety, performance, and cost effectiveness of buildings. SWA has a long-standing commitment to creating energy-efficient, cost-saving and resource-conserving buildings. As consultants on the built environment, SWA works closely with architects, developers, builders, and local, state, and federal agencies to develop and apply sustainable, 'whole building' strategies in a wide variety of building types: commercial, residential, educational and institutional.

SWA performed an energy audit and assessment at the Anderson Building for the Unitarian Society of Ridgewood at 113 Cottage Place, Ridgewood, NJ. The process of the audit included a facility visit on February 12th 2015, benchmarking and energy bill analysis, assessment of existing conditions, energy conservation measures and other recommendations for improvements. The scope of work includes providing a summary of current building conditions, current operating costs, potential savings, and investment costs to achieve these savings. The facility description includes energy usage, occupancy profiles and current building systems along with a detailed inventory of building energy systems, recommendations for improvement and recommendations for energy purchasing and procurement strategies.

The goal of this Local Government Energy Audit is to provide sufficient information to the Unitarian Society of Ridgewood to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures.

HISTORICAL ENERGY CONSUMPTION

Energy Usage, Load Profile and Cost Analysis

SWA reviewed electric utility and natural gas utility bills from November 2012 through October 2014 that were received from the Unitarian Society of Ridgewood (USR). A 12-month period of analysis from November 2013 through October 2014 was used for all calculations regarding electrical and natural gas energy savings.

Electricity – The building is currently served by one electric meter, supplied by Direct Energy and delivered by Public Service Electric and Gas Company. Electricity is predominantly used for lighting, heating equipment, cooling equipment and miscellaneous plug loads. Electricity was purchased at an average aggregated rate of \$0.197/kWh and Anderson Building consumed approximately 57,930 kWh, or \$11,432 of electricity, for the electric billing analysis period.

The chart below shows the monthly electric usage and costs. The dashed green line represents the approximate base load or minimum electric usage required to operate the building. The baseline usage for the facility is approximately 3,570 kWh. The consumption profile seen is atypical for a building with similar characteristics as peak consumption occurs in February. It is expected that the building with electric cooling systems experience peak consumption during the summer months but this does not occur. Building staff should consider investigating this anomaly although the sporadic energy profile and unusual peak are likely the result of the building being utilized inconsistently throughout the year.

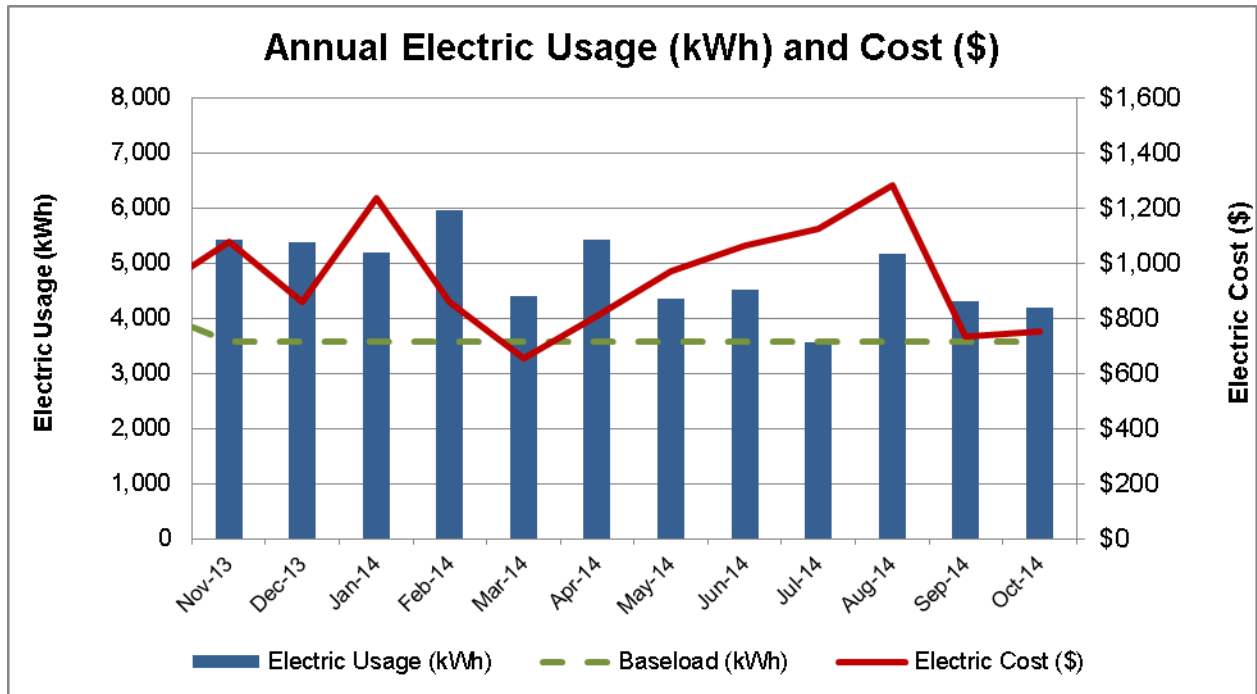


Figure 1 Annual Electric Usage and Costs

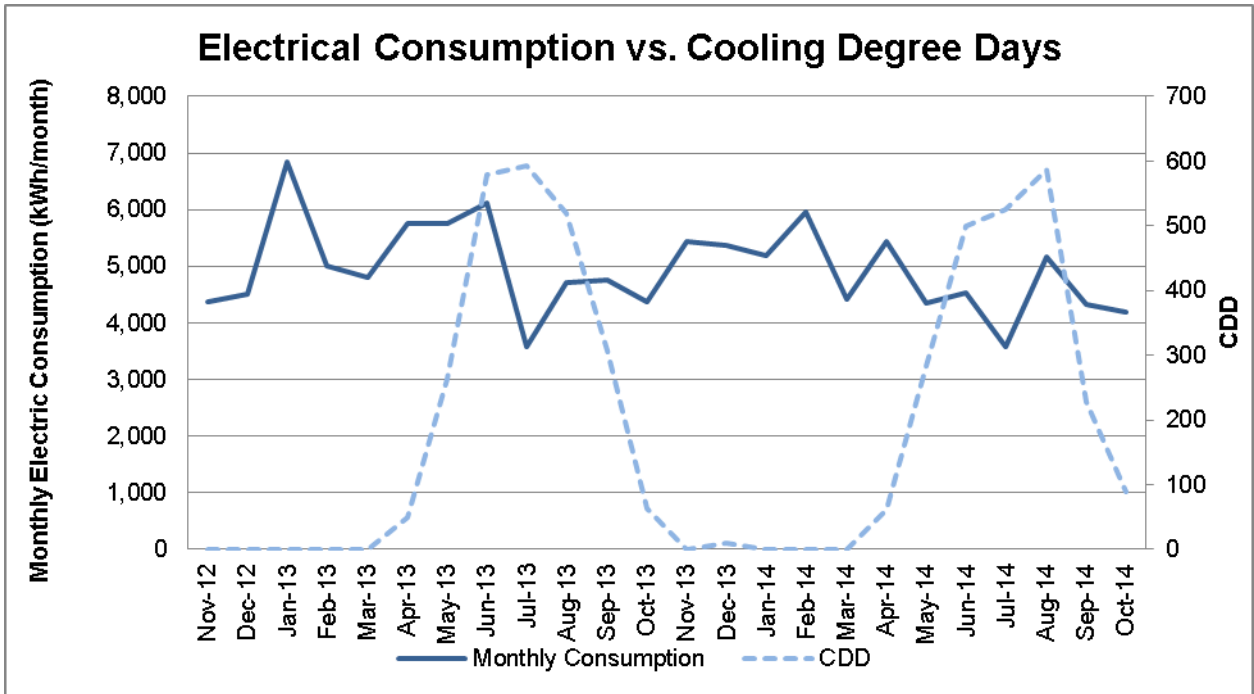


Figure 2 Electric Consumption and Cooling Degree Day Curves

The chart above shows the monthly electricity usage along with the cooling degree days or CDD. Cooling degree days is the difference of the average daily temperature and a base temperature of 50°F, on a particular day. As seen in the chart the building does not appear to respond well to cooling degrees. This is shown by the lack of correlation between electricity consumption and cooling degree days. This is likely due to the sporadic use of the spaces within the building but in a building with natural gas heating and electric cooling, electricity usage is expected to peak over the summer and reduce over the winter period. However, this is not seen in the Anderson Building where the highest electric usage is seen over the winter months. It is recommended that this analysis be performed periodically to provide a means of tracking performance with regard to cooling requirements.

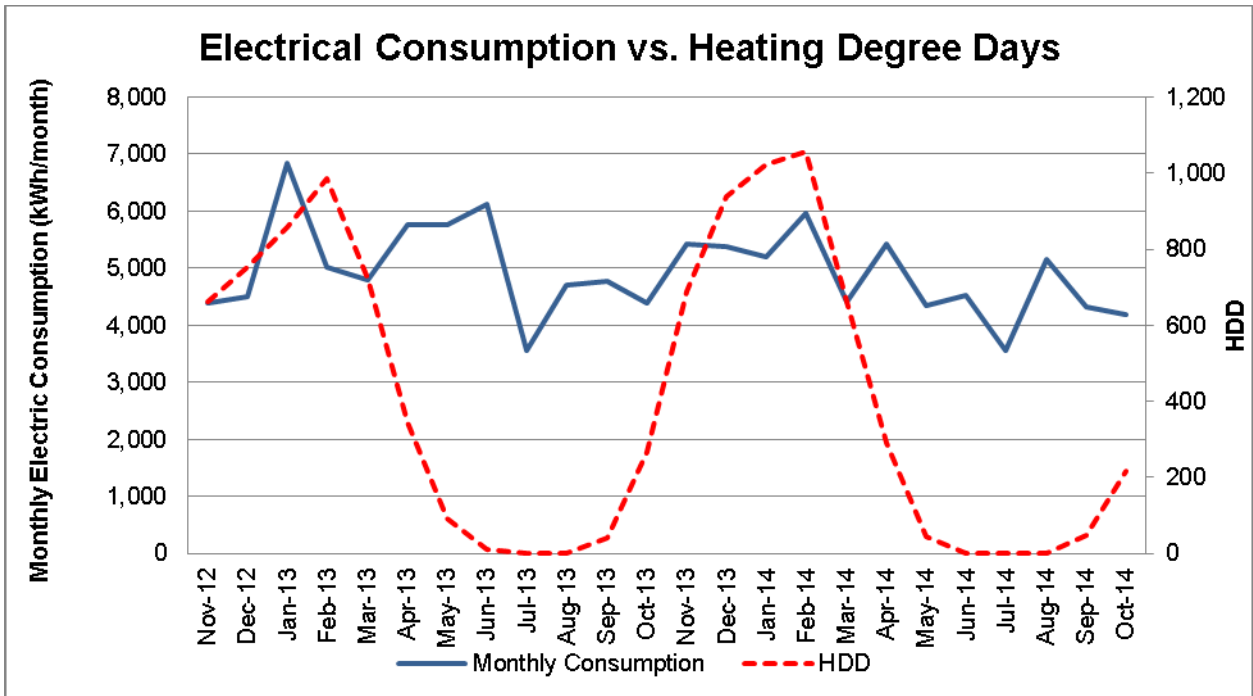


Figure 3 Electric Consumption and Heating Degree Day Curves

The chart above shows the monthly electricity usage along with the heating degree-days or HDD. Heating degree-days is the difference of the average daily temperature and a base temperature of 65°F, on a particular day. The heating degree-days are zero for the days when the average temperature exceeds the base temperature. As expected, the electricity consumption profile does not follow the HDD curve. Here we see that there is little to no correlation between HDD and therefore heating requirements.

Natural Gas – The building is served by one natural gas meter, which is supplied by Direct Energy and delivered by Public Service Electric and Gas Company. Natural gas was purchased at an average aggregated rate of \$1.11/therm and the Anderson Building consumed 4,489 therms, or \$4,995 of natural gas, for the analyzed billing period. The chart below shows the monthly natural gas usage and costs. As expected, usage peaks in the winter months in conjunction with the enabling of heating mode. Consumption of natural gas then continues at a baseline value of 49 therms/month during the remainder of the year as domestic hot water is provided by a natural gas hot water heater. Additionally, it was noted the oven in the kitchen area of the building utilized a gas pilot light which remains lit year round. Should the oven be replaced the baseline natural gas consumption would be reduced.

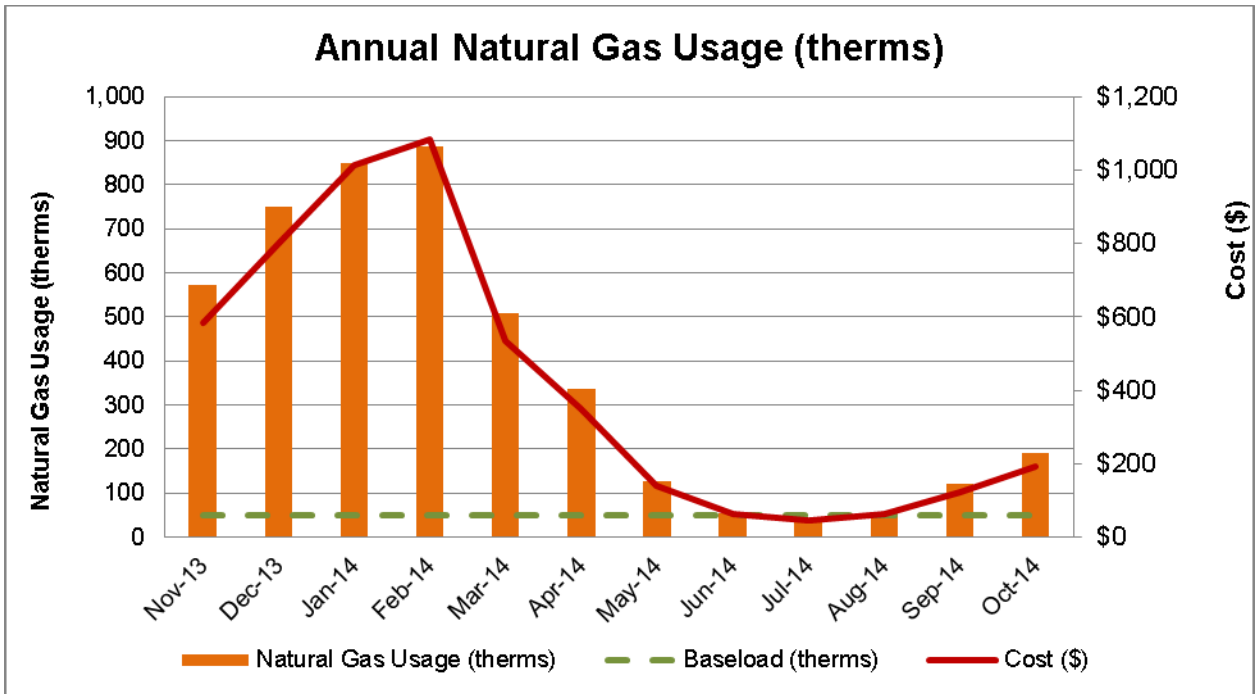


Figure 4 Annual Natural Gas Usage

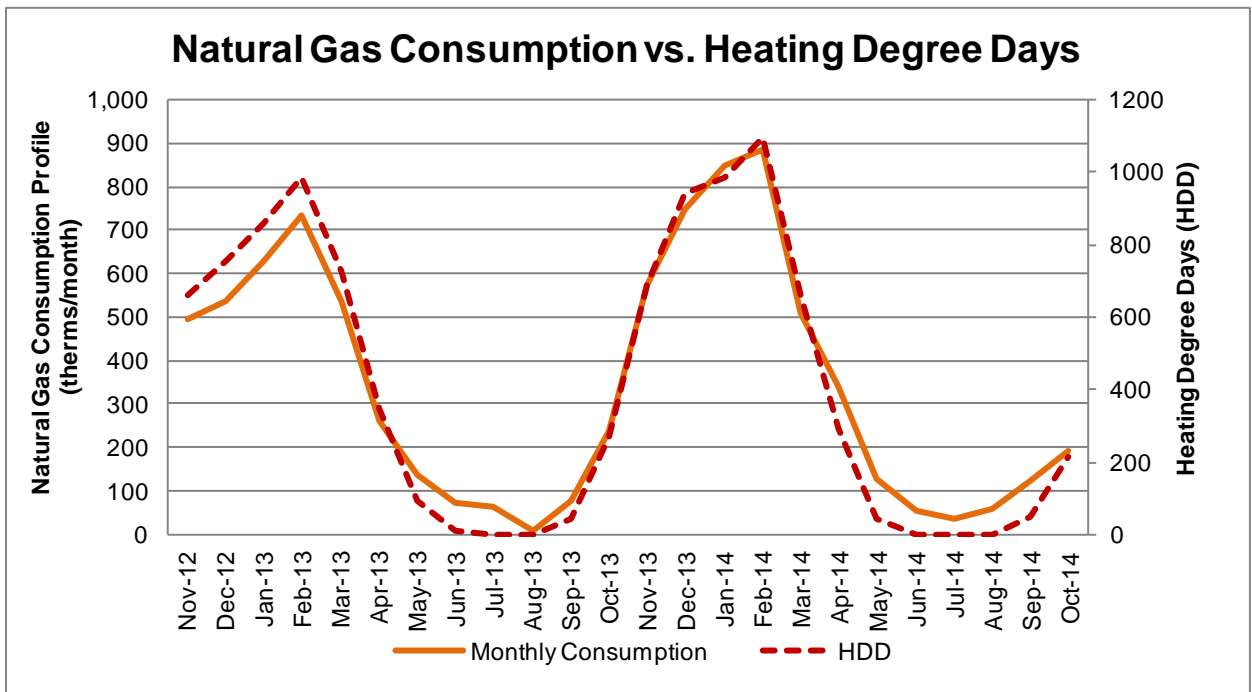


Figure 5 Natural Gas Usage and Heating Degree Day Curves

The chart above shows the monthly natural gas usage along with the heating degree days or HDD. As expected, the natural gas consumption profile follows a curve similar to the HDD curve. Here we also see that there are little to no anomalies and any variation in consumption from year to year is due to changes in HDD and therefore heating requirements. It is recommended that this analysis be performed periodically to provide a means of tracking performance with regard to heating requirements.

The following pie charts and table show energy use for the Anderson Building are based on utility bills for the analyzed billing period. Note: Electrical cost at \$58/MMBtu of energy is more than 5 times as expensive as natural gas at \$11/MMBtu.

Annual Energy Consumption / Costs					
	MMBtu	%MMBtu	\$	%\$	\$/MMBtu
Electric Misc/Plug Loads	81	13%	\$4,696	29%	\$58
Electric for Cooling	30	5%	\$1,733	11%	\$58
Electric for Heating	18	3%	\$1,013	6%	\$58
Lighting	45	7%	\$2,624	16%	\$58
Ventilation	24	4%	\$1,366	8%	\$58
Domestic Hot Water (Gas)	18	3%	\$198	1%	\$11
Building Space Heating (Gas)	431	67%	\$4,798	29%	\$11
Totals	647	100%	\$16,427	100%	\$25
Total Electric Usage	198	31%	\$11,432	70%	\$58
Total Gas Usage	449	69%	\$4,995	30%	\$11
Totals	647	100%	\$16,427	100%	\$25

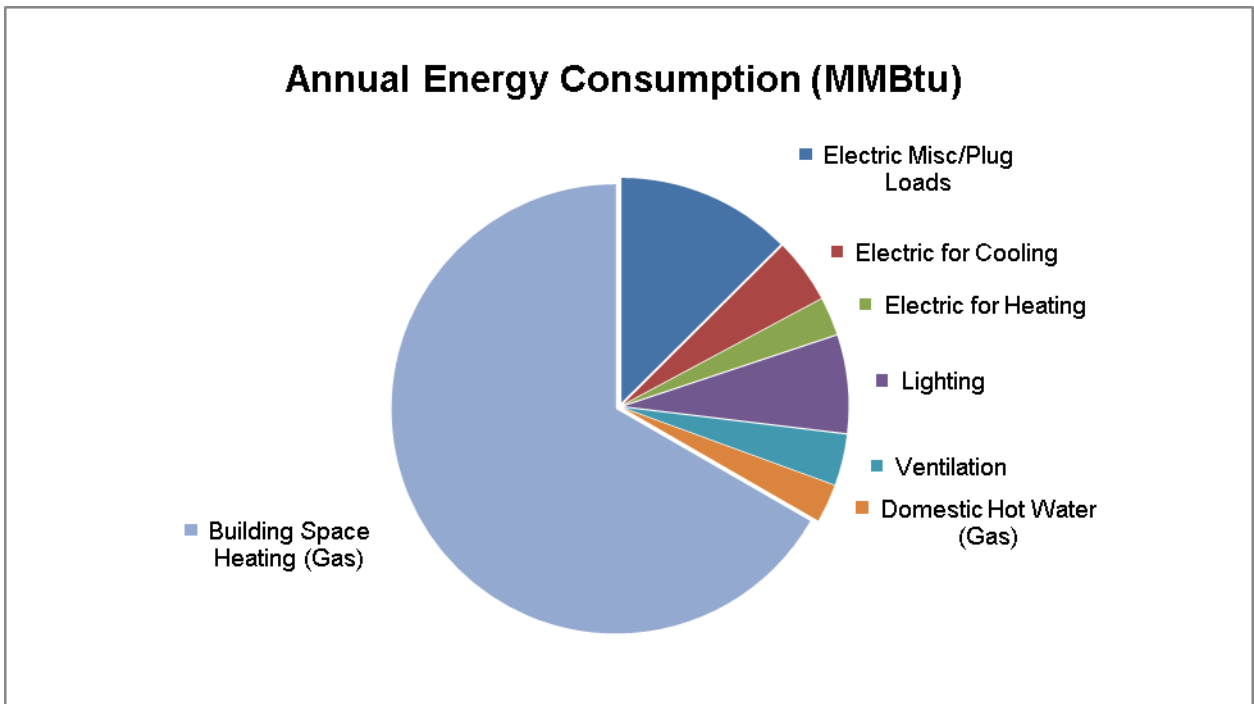


Figure 6 Annual Energy Consumption Breakdown Estimate

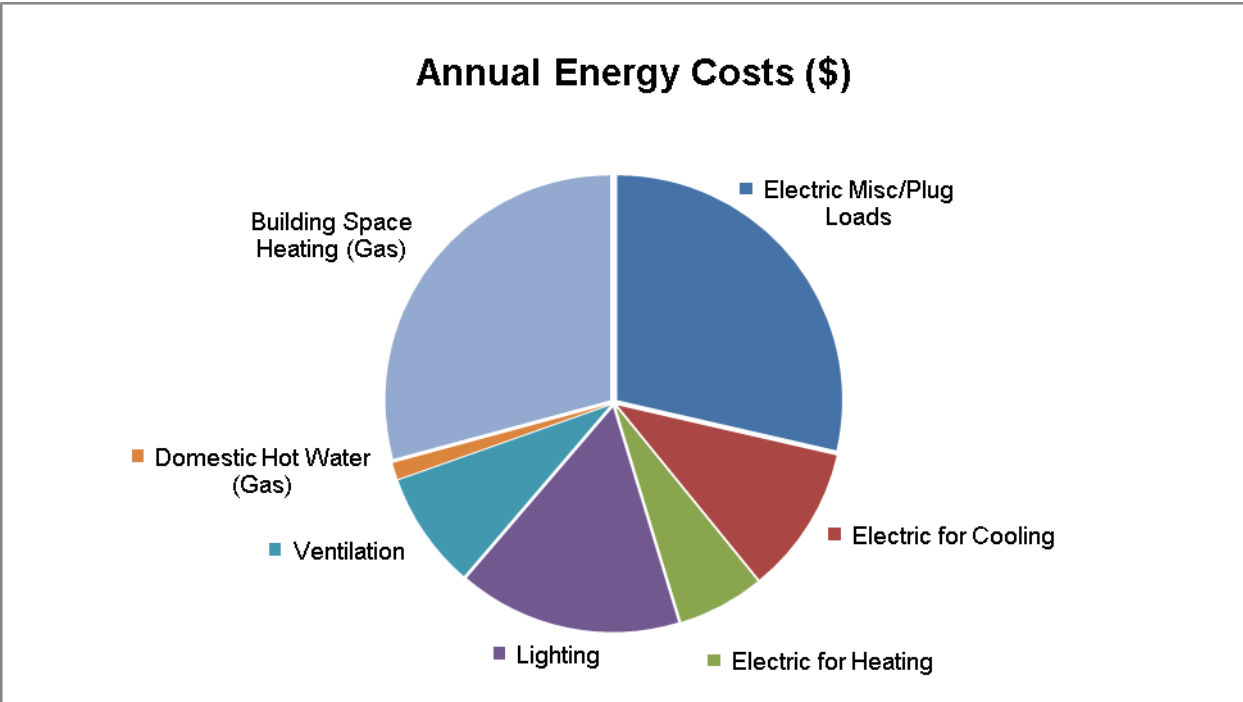


Figure 7 Annual Energy Cost Breakdown Estimate

Energy Benchmarking

SWA has entered energy information about the building in the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® Portfolio Manager energy benchmarking system. This facility is categorized as a "Worship Facility" space type. The ENERGY STAR Energy Performance Rating was calculated to be 41. The Site Energy Utilization Intensity (Site EUI) was calculated to be 78.9 kBtu/ft²/yr compared to the National Median of 71.8 kBtu/ft²/yr. The Source Energy Utilization Intensity (Source EUI) was calculated to be 133.2 kBtu/ft²/yr compared to the National Median of 121.3 kBtu/ft²/yr the Anderson Building, therefore, has a higher source EUI, with approximately 10% difference from the national average kBtu/ft²/yr. See the ECM section for guidance on how to reduce the building's energy intensity.

The ENERGY STAR® Portfolio Manager uses a national survey conducted by the U.S. Energy Information Administration (EIA). This national survey, known as the Commercial Building Energy Consumption Survey (CBECS), is conducted every four years, and gathers data on building characteristics and energy use from thousands of buildings across the United States. Due to insufficient data in the 2007 survey, Portfolio Manager continues to use data provided by 2003 survey. The Portfolio Manager software uses this data to create a database by building type. By entering the building parameters and utility data into the software, Portfolio Manager is able to generate a performance scale from 1-100 by comparing it to similar library buildings. This 100 point scale determines how well the building performs relative to other buildings across the country, regardless of climate and other differentiating factors.

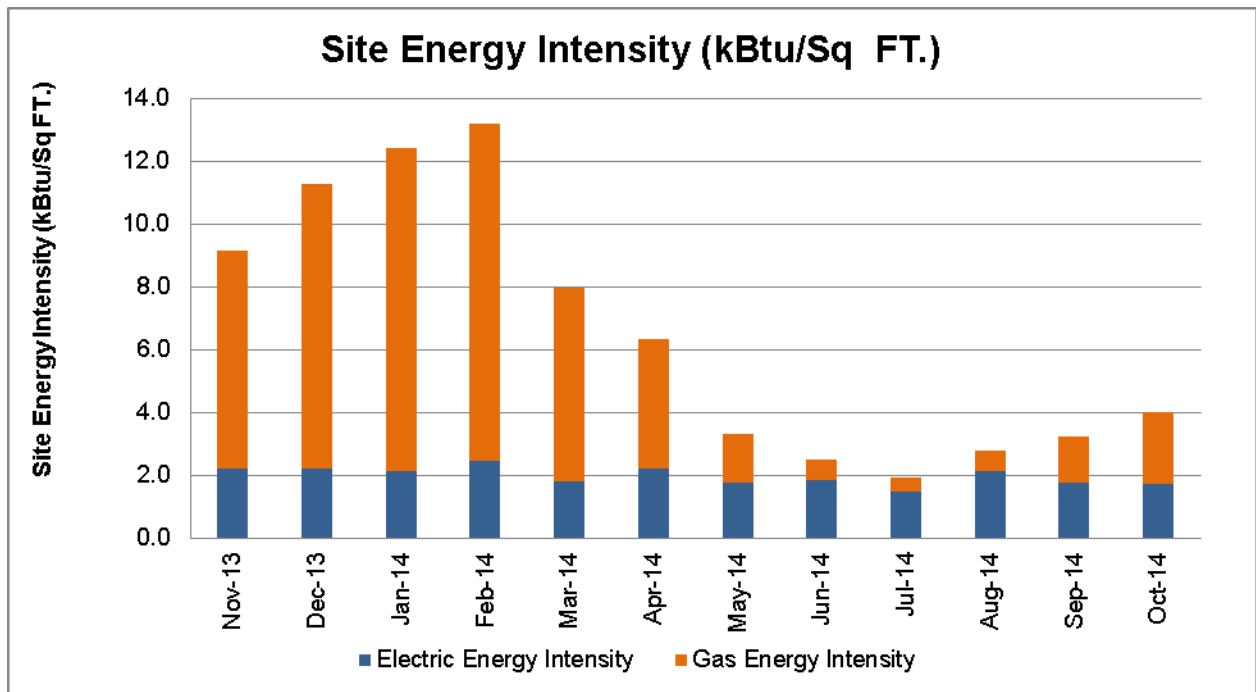


Figure 8 Monthly Site Energy Intensity Breakdowns per Energy Type

Per the LGEA program requirements, SWA has assisted the Unitarian Society of Ridgewood in creating an ENERGY STAR® Portfolio Manager account and sharing the library information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager account information with the Unitarian Society of Ridgewood (user name of "██████████" with a password of "██████████").

Tariff Analysis

Tariff analysis can help determine if the Anderson Building is paying the lowest rate possible for electric and gas service. Tariffs are typically assigned to buildings based on size and building type. Rate fluctuations are expected during periods of peak usage. Natural gas prices often increase during winter months since large volumes of natural gas is needed for heating equipment. Similarly, electricity prices often increase during the summer months when additional electricity is needed for cooling equipment.

As part of the utility bill analysis, SWA evaluated the current utility rates and tariffs for the Anderson Building. The electric use for the building is direct-metered and purchased under a service rate schedule that includes an annual demand charge, peak summer demand charge and societal benefits charge. The rate schedule is a market-rate based on electric usage and electric demand. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. The Anderson Building is also paying for natural gas under a rate schedule, which includes fixed costs such as customer service charges.

Energy Procurement Strategies

Utility analysis was conducted using an average aggregated rate which is estimated based on the total cost divided by the total energy usage for each utility over a 12 month period. Average aggregated rates do not separate demand charges from usage, and instead provide a metric of inclusive cost per unit of energy. Average aggregated rates are used in order to equitably compare building utility rates to average utility rates throughout the state of New Jersey.

The average estimated NJ commercial utility rate provided by US Energy Information Administration for electric is \$0.137/kWh, while Anderson House pays a rate of \$0.197/kWh. The building's annual electric utility costs are \$3,476 higher, when compared to the average estimated NJ commercial utility rates. Electric bill analysis shows rate fluctuations up to 57% over the analyzed billing period. The electric rate fluctuations in the winter and spring can be attributed to a combination of demand charges and market rate changes. The Anderson Building already utilizes a third-party supplier, which generally reduces the supply costs and brings the overall electric costs down although SWA recommends that other third party suppliers be investigated to determine if there is a more economic way to source electricity.

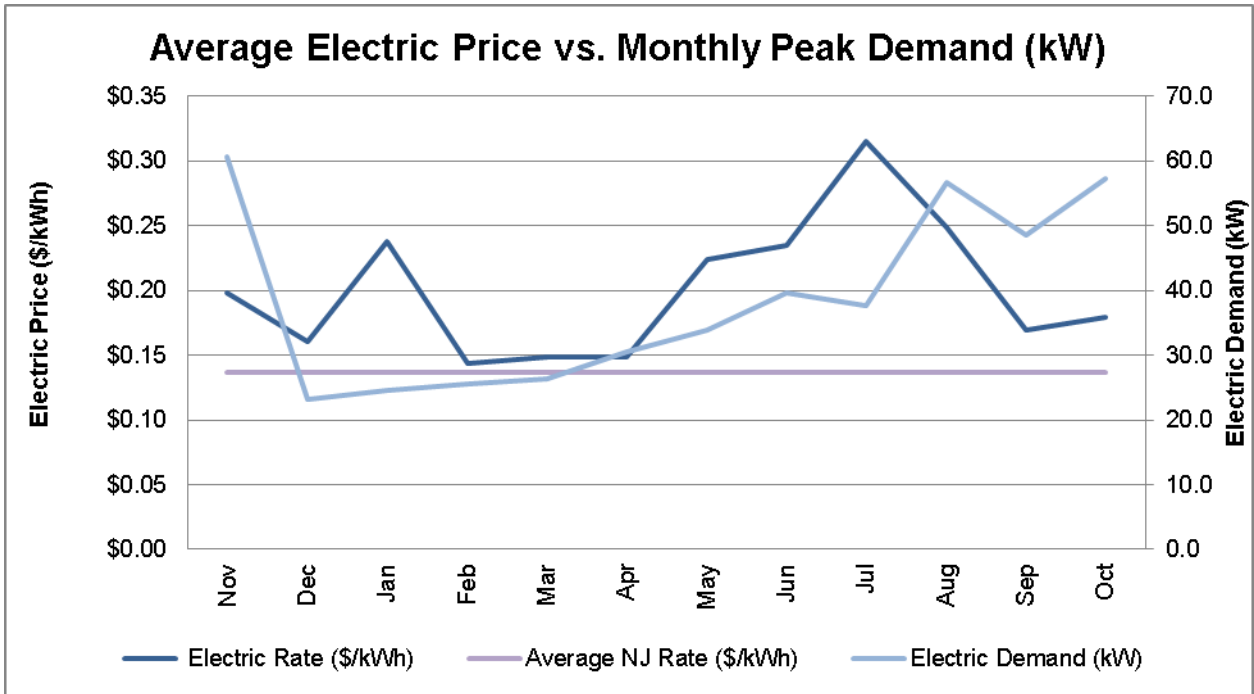


Figure 9 Average NJ Electric Rate, Average Aggregated Electric Rate and Electric Demand

The average estimated NJ commercial utility rate provided by US Energy Information Administration for gas is \$0.811/therm, while the building pays a rate of \$1.11/therm. The Anderson Building's annual natural gas costs are \$1,342 higher, when compared to the average estimated NJ commercial utility rates. The natural gas rate analysis shows fluctuations up to 11% over the analyzed billing period excluding months where there was no natural gas consumption. Utility rate fluctuations when entering and exiting the heating months were caused by a combination of low usage and the assessment of fixed fees and costs.

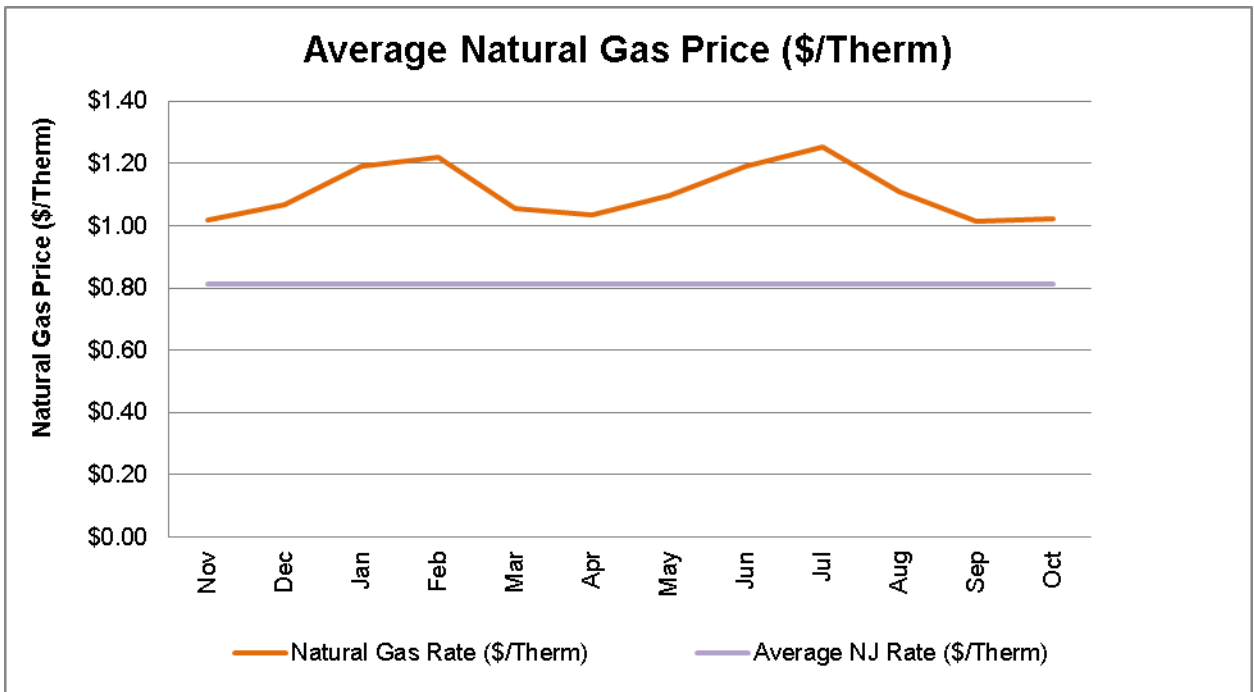


Figure 10 Average NJ Gas Rate and Monthly Gas Rates

SWA recommends that the building continue utilizing the opportunity of purchasing electricity and natural gas from third-party suppliers in order to maintain the reduced rate. Additionally, SWA recommends that the society further explore opportunities of purchasing electricity and natural gas from another third-party supplier to reduce the annual cost of energy for the Anderson Building. Appendix D contains a complete list of third-party energy suppliers for the Anderson Building's service area.

EXISTING FACILITY AND SYSTEMS DESCRIPTION

This section gives an overview of the current state of the facility and systems. Please refer to the Proposed Further Recommendations section for recommendations for improvement.

Based on a visit from SWA in February 2015, the following data was collected and analyzed.

Building Characteristics

The Unitarian Society of Ridgewood Anderson Building is a two-story 8,252-ft² facility with a basement level. The major spaces within the building are the Anderson Auditorium, the Fellowship Room, commercial kitchen, youth room, classrooms, and nursery. The building was originally built in the late 1960s but underwent a major renovation in 1996 at which time the building was enlarged and a majority of the mechanical equipment was installed.

There are several functions and end-users of the facility. The USR rents out the spaces in the building to various groups for activities including: exercise classes, music recitals, community parties and education classes. A majority of the activities are held in the Anderson Auditorium and Fellowship Room that have capacity to seat approximately 100 and 200 people respectively.



Image 1: Front Entrance

Building Occupancy Profiles

The Anderson Building is occupied on Sunday mornings for the Church Service from 10AM to 12PM in the Anderson Auditorium. Afterwards, the congregation spends approximately an hour in the Fellowship Room. As a result, the HVAC system for the building is turned on at 9AM each Sunday to ensure the space is comfortable by 10AM.

The basement of the Anderson Building is used as a day care during the week with approximately 25 children present and 4 adults supervising. The day care occupies the back section of the basement and consists of classrooms and kitchen/dining area. These areas are occupied Monday to Friday from 8 am to 4 pm. In addition, the basement is utilized by parents and children on Sundays when Church Services are held. Parents and children during this time occupy the front nursery section of the basement from 10 am to 2pm on Sundays.

Additional occupancy of the building was obtained from schedules provided by the Unitarian Society of Ridgewood for November and December 2014. It was assumed that the occupancy

in these months was typical and representative of the occupancy schedule for the remainder of the year. From the schedules it was calculated Anderson Auditorium is occupied for an additional 7.5 hours per week and the Fellowship Room occupied for an additional 13 hours per week.

Building Envelope

On February 12, 2015, SWA performed a building envelope analysis. At this time, the average outside dry bulb temperature was approximately 28°F with an average wind speed of 7 mph. The building envelope consists of the outer shell of the building including the walls, windows, doors, and roof. This section will examine the overall condition of the envelope and note any deficiencies discovered during the audit.

General Note: All findings and recommendations on the exterior envelope (base, walls, roofs, doors and windows) are based on the energy auditors' experience and expertise on detailed visual analysis, as far as accessibility and weather conditions allowed at the time of the field audit.

Exterior and Interior Walls

The exterior construction of the building is comprised mainly of wooden shingles with an unconfirmed level of insulation. Based on the year of construction of the section and staff provided information, SWA estimates that there is little insulation installed in the exterior walls. Because the building has little insulation, the exterior walls likely experience more heat loss.

The Anderson Auditorium section of the building was found to be in good-to-fair condition, with a few notable areas of uncontrolled moisture and air leakage near entry doors. In the Anderson Auditorium there is also a ventilation structure built into the west-facing wall which allows air to pass into the auditorium through gaps in its construction (Image 3). There was a cover over the structure but it is not airtight and therefore ineffective. The use of this structure is not completely understood by building staff and is not monitored, operated or controlled in any way.



Image 2: Building Exterior



Image 3: Ventilation Structure in Anderson Auditorium

Roof

The roof consists of high-sloped roof sections covered with asphalt shingles which was inaccessible for inspection at the time of the site visit. Additionally, as the underside of the roof is finished it was not possible for SWA to confirm any insulation levels.

Roofs, related flashing, gutters and downspouts were inspected during the field audit. They were reported to be in overall good condition. Although SWA could not access the exterior of the roof, building maintenance personnel have not had any issues or leaks associated with the roof.

Base

The building's base contains a finished basement level that houses the children day care center.

The building's base and its perimeter were inspected for signs of uncontrolled moisture or water presence and other energy-compromising issues. Overall, the base was reported to be in good condition with no signs of uncontrolled moisture, air-leakage and/or other energy-compromising issues that were neither visible on the interior nor exterior.

Windows

The buildings windows consist of the following types:

1. Double Pane Windows with Aluminum Frames
 - a. Anderson Auditorium back windows
 - b. Basement windows
2. Single Pane Windows with Wooden Frames
 - a. Anderson Auditorium front and side windows
3. Single Pane Windows with Aluminum Frames
 - a. Second floor

Windows, shading devices, sill, related flashing and caulking were inspected as far as accessibility allowed for signs of moisture, air-leakage, and other energy compromising issues. The windows in the auditorium are a mix double and single pane for which the caulking and window frames were found to be in good condition. Windows in the basement were found to be in very good condition with and double paned. The second floor windows were few but were in fair condition and single paned.

Exterior Doors

The building contains the following exterior doors:

1. Wooden Swing doors, with no windows and brush weather-stripping at bottom. These doors are located at the front entrance of the building and side entrance opening onto the stairwell and elevator. These doors were installed were in fair condition with some damage to the base of the door. This included visible signs of gaps at the base as well as between the two doors. The front entrance doors open into a vestibule to reduce air transfer from outside.

2. Wooden door with single pane glass. This door is in the Fellowship Room opening to the rear of the building. It appeared in fair condition, with small gaps in between frame and door at side and base. This allowed a small outside air to infiltrate into the space.

Overall weather-stripping for the doors was found to be in reasonable condition with some air-leakage, although no signs of uncontrolled moisture. Poor weather stripping allows unconditioned air to enter the building, leading to increased energy using for space conditioning.



Image 4: Main Door (Exterior)



Image 5: Main Door (Interior)

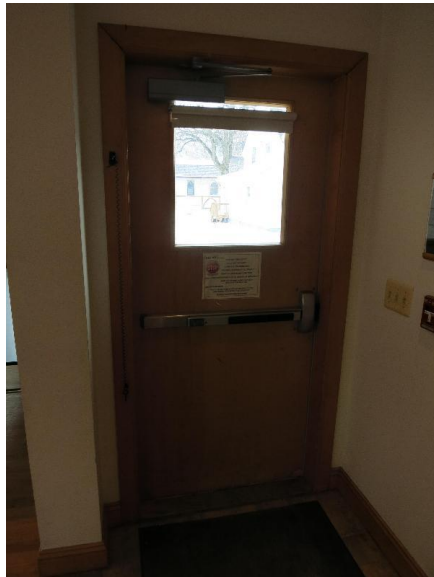


Image 6: Back Door (Interior)



Image 7: Back Door (Interior)

Building Air-Tightness

During the walkthrough, there were areas of infiltration noted at the three doors, as described in the previous sections.

In the other areas of the building, the field auditors found the building to adequately air-tight with a few areas of suggested improvements. The air tightness of buildings helps maximize all other implemented energy measures and investments, and minimizes potentially costly long-term maintenance, repair and replacement expenses.

Mechanical Systems

Heating, Ventilation and Air Conditioning

The primary HVAC system at the Anderson Building consists of - three air handling units with split AC coils and hot water coils, and two boilers. One air handling unit serves the Anderson Auditorium, one serves the Fellowship Room/Kitchen area and one serves the classrooms in the basement. An additional gas furnace heater serves the nursery in the basement.

Equipment

Heating Systems

Heating for the building is divided into four sections, the Anderson Auditorium, the Fellowship Room/kitchen area, the basement classroom section and the basement nursery.

The Anderson Auditorium, the Fellowship Room/kitchen area, the basement classrooms section are served by two (2) 750,000 Btu/HR Lochnivar Power-Fin boilers with a design efficiency of 88%. The boilers were installed in 1996 and are within a year of reaching their estimated useful life. At the time of the walkthrough Boiler #1 and #2 were set to maintain the HHW system at 170°F and 220°F respectively. However, Boiler #2 was being serviced and was not in operation during the time of the site visit. It was noted that the set point for Boiler #2 was likely increased beyond its typical operating set point as part of the ongoing maintenance.

The boilers are controlled in relation to air temperature in the Fellowship Room and Anderson Auditorium. At the time of the walkthrough, the set-point room temperature for both spaces was 70°F. The boilers are set to maintain heating hot water temperatures 24/7 as long as the space temperature is below the designated set-point.

The boilers provide heating hot water to the three air handling units (AHUs) which serve the following sections of the building:

- Anderson Auditorium;
- Fellowship Room and Kitchen Area
- Basement Classrooms

The air handling units are operated as per schedules although if the areas are used outside the scheduled times occupants can turn on the air handling units with timed override switches. These switches are located in each of the area next to the thermostat, see picture of the override switch in Image 11 below.

At the time of the walkthrough, the Anderson Auditorium air handling unit was set as follows:

- Sunday at 8:18AM → ON
- Sunday at 10:00AM → OFF
- Monday to Saturday → OFF

The Fellowship room air handling unit was set as follows:

- Sunday at 9:00AM → ON
- Sunday at 12:05PM → OFF
- Monday to Saturday → OFF

The Basement - Classroom air handling unit was set as follows:

- Monday to Friday → 7:30AM to 4:00PM
- Saturday → None
- Sunday → 7:00AM to 12:15PM

All three air handling units were installed in 1996 and have now exceeded their expected useful life.

The nursery in the basement has a natural gas fired Lennox Furnace Heater. The efficiency and capacity of the heater could not be verified during the inspection but it was installed in 1996 and is approaching its estimated useful life. The nursery furnace heater is controlled by a thermostat schedule which is as follows:

Occupied Temperature Set Point → 72°F
 Unoccupied Temperature Set Point → 55°F

Occupancy Schedule:

- Monday to Friday → 7:30AM to 4:00PM
- Saturday → None
- Sunday → 7:00AM to 12:15PM

Table 3: Summary of Heating Systems

Unit	Zone Served	Control System
AHU 1	Anderson Auditorium	Schedule + Timed Override Switch
AHU 2	Fellowship Room, Hallway & Kitchen	Schedule + Timed Override Switch
AHU 3	Basement - Classrooms	Schedule + Timed Override Switch
FH	Basement – Nursery	Schedule

Cooling Systems

Cooling for the building is divided into four sections, the Anderson Auditorium, the Fellowship Room/kitchen area, the basement classroom section and the basement nursery.

The Anderson Auditorium, the Fellowship Room/kitchen area, the basement classrooms section are service by three (3) Lennox Split AC Units with efficiencies of 9.2 EER. The units were installed in 1996 and are passed their respective estimated useful lifes.

The Split AC Units provide cooling to the three air handling units with each serve one of the following sections:

- The Anderson Auditorium;
- The Fellowship Room/kitchen area; and
- The Basement Classrooms section.

The air handling units are operated as per schedules although if the areas are used outside the scheduled times occupants can turn on the air handling units with timed override switches. These switches are located in each of the area next to the thermostat, see picture of the override switch in Image 11 below.

Cooling schedules for the Anderson Auditorium, Fellowship Room and Basement Classroom sections are the same for heating. Refer to *Heating System* section above for schedules.

The nursery in the basement has an additional AC unit of unknown efficiency and capacity. The furnace heater was installed in 1996 and is beyond its estimated useful life by four years. The nursery AC unit is controlled through a thermostat schedule which is as follows: When occupied cool to 72°F, when unoccupied cool to 85°F.

Occupied:

- Monday to Friday → 7:30AM to 4:00PM
- Sunday → 7:00AM to 12:15PM

Table 4: Summary of heating systems

Unit	Zone Served	Capacity
AHU 1	Anderson Auditorium	20 Ton
AHU 2	Fellowship Rm, Hallway & Kitchen	20 Ton
AHU 3	Basement - Classrooms	15 Ton
FH	Basement – Nursery	CNV



Image 9: AHU 1

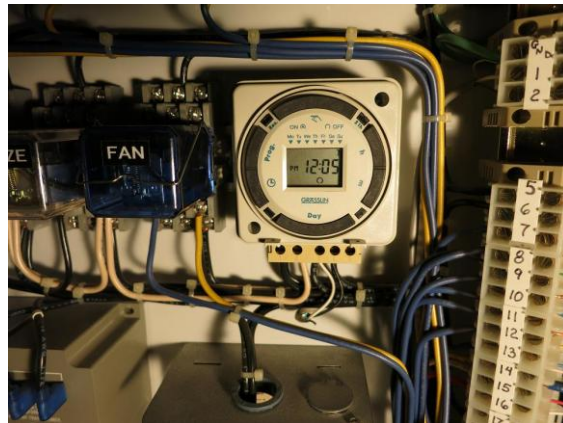


Image 10: AHU 1 Schedule Control

Ventilation

Ventilation throughout the facility is provided by windows and through the AHU units. The windows are manually controlled by the occupants at the time.

Controls

Wall mounted temperature sensors within the Anderson Auditorium and Fellowship Room, basement classroom and nursery supply information to the controller in each of the three (4) AHUs and the basement furnace system independently.

The basement furnace is controlled entirely by temperature sensor and a pre-programmed schedule. AHUs in the Anderson Auditorium, Fellowship Room and Basement Classrooms controlled by both a schedule and have addition timed switch in each area. The switches override the schedule allowing heating or cooling at any time the occupants require.

Wall mounted temperature sensors in the Anderson Auditorium and Fellowship Room inform the two boilers control system as to when to maintain hot water temperature.



Image 11: Thermostat and Override Switch



Image 12: Thermostat in Basement Classroom Image 13: Temperature Control for Boilers

Domestic Hot Water

Domestic hot water is provided by one (1) natural gas domestic hot water heater, which is located in the boiler room on the 2nd floor. It is a 50-gallon Bradford White heater with an input of 42,000 Btu/Hr of natural gas. The unit has an adjustable thermostat which allows selection of the water temperature however the thermostat has no indications for temperature but instead indicates the temperatures between “Warm” and “Very Hot”.



Image 14: DHW Heater

Electrical Systems

Lighting

See attached lighting schedule in Appendix B for a complete inventory of lighting throughout the building including estimated power consumption and proposed lighting recommendations.

Interior Lighting – Lighting throughout the building primarily consisted of T8 linear fluorescent fixtures in the hallways, closets, kitchen, basement and 2nd floor. In the Anderson Auditorium however all light globes have been upgraded with LED low wattage versions in spotlights and down lights. The Fellowship Room also has different lighting configuration with incandescent globes in all 30 fittings.

Exit Lights – All of the emergency exits signs have been upgraded to LED exit signs, which operate on low wattage and have a long lifespan.

Exterior Lighting – Lighting along the exterior of the building varied and consisted of high pressure sodium in the car park, compact fluorescent on the external building walls incandescent lamps highlight the stainless windows. Exterior lamps are operated on a timer schedule and are set to activate for an average of five (5) hours a day all year round.



Image 15: Fellowship Room Chandelier Fixture



Image 16: 240W Sodium Vapor Exterior Lamp

Other Electrical Systems

In addition to the major building system described above, the Anderson Building is equipped with a few other electrical systems. This primarily includes kitchen appliances such as cooking equipment, coffee makers, microwaves and refrigerators.

RENEWABLE AND DISTRIBUTED ENERGY MEASURES

Renewable energy is defined as any power source generated from sources which are naturally replenished, such as sunlight, wind and geothermal. Technology for renewable energy is improving and the cost of installation is decreasing due to both demand and the availability of government-sponsored funding. Renewable energy reduces the need for using either electricity or fossil fuel, therefore lowering costs by reducing the amount of energy purchased from the utility company. Solar photovoltaic panels and wind turbines use natural resources to generate electricity. Geothermal systems offset the thermal loads in a building by using water stored in the ground as either a heat sink or heat source. Cogeneration or Combined Heat and Power (CHP) allows for heat recovery during electricity generation.

Existing systems

Currently there are no renewable energy systems installed in the building.

Evaluated Systems

Solar Photovoltaic

Photovoltaic panels convert light energy received from the sun into a usable form of electricity. Panels can be connected into arrays and mounted directly onto building roofs, as well as installed onto built canopies over areas such as parking lots, building roofs or other open areas. Electricity generated from photovoltaic panels is generally sold back to the utility company through a net meter. Net-metering allows the utility to record the amount of electricity generated in order to pay credits to the consumer that can offset usage and demand costs on the electric bill. In addition to generation credits, there are incentives available called Solar Renewable Energy Certificates (SRECs) that are subsidized by the state government. Specifically, the New Jersey State government pays a market-rate SREC to facilities that generate electricity in an effort to meet state-wide renewable energy requirements.

The Anderson Building was assessed for suitability for a solar photovoltaic system. However, because the roof has several small sloped areas and tree cover the building is not a good candidate for a solar photovoltaic installation.

Solar Thermal Collectors

Solar thermal collectors are not cost-effective for this building and would not be recommended due to the insufficient and intermittent use of domestic hot water throughout the building to justify the expenditure.

Wind

The Anderson Building is not a good candidate for wind power generation due to insufficient wind conditions in this area of New Jersey.

Geothermal

The Anderson Building is not a good candidate for geothermal installation since it would require replacement of the entire existing HVAC system, as well as extensive installation of geothermal wells and pumping equipment.

Combined Heat and Power

The Anderson Building is not a good candidate for CHP installation and would not be cost-effective due to the size and operations of the building. Typically, CHP is best suited for buildings with a constant electrical base load to accommodate the electricity generated, as well as a means for using waste heat generated.

PROPOSED ENERGY CONSERVATION MEASURES

Energy Conservation Measures (ECMs) are recommendations determined for the building based on improvements over current building conditions. ECMs have been determined for the building based on installed cost, as well as energy and cost-savings opportunities.

Recommendations: Energy Conservation Measures

#	Energy Conservation Measures
ECM 1	Install Insulation and Fill in Ventilation Structure in Anderson Hall
ECM 2	Install Low-Flow Aerators on All Building Faucets
ECM 3	Install Insulation on Hot Water Supply and Return for AHU 2
ECM 4	Install Weather-Stripping and Door Sweeps on the Front Doors
ECM 5	Replace High Pressure Sodium, Incandescent and Fluorescent Lamps with LED

In order to clearly present the overall energy opportunities for the building and ease the decision of which ECM to implement, SWA calculated each ECM independently and did not incorporate slight/potential overlaps between some of the listed ECMs (i.e. lighting change influence on heating/cooling).

ECM 1: Install Insulation and Fill in Ventilation Structure in Anderson Hall

The Anderson Building was found to have a ventilation structure in the Anderson Auditorium which was unused. There were gaps present between the shutters and the framing, which allows for unwanted air infiltration and heat transfer between conditioned indoor spaces and the outdoors. This results in increased energy to heat and cool the spaces, as well as in the infiltration of air that contains dust and particulates that impact cleanliness and indoor environmental quality. See *Image 3* in *Existing Faculty and Systems Description* section for picture of the structure.

SWA recommends leaving the ventilation structure in place, filling the indoor space with insulation (directly on to the structure) then covering it with plaster wall board. Before the insulation and wall board is installed it is recommended that the ventilation structure be securely closed permanently to ensure no moisture/rain is able to penetrate it and come in contact with the insulation.

Installation Cost:

Estimated Installed Cost: \$154.72 (Includes \$82.88 of Labor)

Source of Cost Estimate: RS Means, Published and Established Costs

Economics:

ECM #	ECM Description	Est. Installed Cost (\$)	Est. Incentives (\$)	Net Est. ECM Cost with Incentives (\$)	1st Yr Savings (kWh)	Demand Reduction/Mon (kW)	1st Yr Savings (Therms)	1st Yr Savings (kBtu/Sq FT)	Total 1st Yr Savings (\$)	Life of Measure (Yr)	Est. Lifetime Cost Savings (\$)	Simple Payback (Yr)	Lifetime Return on Investment (%)	Annual Return on Investment (%)	Internal Rate of Return (%)	Net Present Value (\$)	CO ₂ Reduced (lbs/Yr)
1	Install Insulation and Fill in Ventilation Structure in Anderson Hall	\$155	\$0	\$155	63	0.0	241	3.0	\$281	10	\$2,811	0.6	1717%	172%	182%	\$1,974	2,774

Assumptions: SWA calculated the heating and cooling loads using Bin data analysis.

gap area	56	sqin	heating setpoint T	72	F	cooling setpoint T	72	F
pressure diff	0.02	in wc	night/weekend heating enabled <	45	F	relative humidity	50%	%
est. infiltration	143.54	CFM	night/weekend cooling enabled >	85	F	room enthalpy	26.39	btu/lb
heating enabled <	60	F	total heating hours	3,411	Hrs	total cooling hours	192	Hrs
cooling enabled >	65	F	heating load	21,241	kBtu/year	cooling load	582	kBtu/year

Assumptions

# Features Requiring Sealing	1		Annual Cooling Hours	192	
Gap Area Per Unit	56	in ²	Annual Heating Hours	3,411	
Pressure Difference	0.02	in. wc	Annual Cooling Load Per Feature	582	kBtu/yr
Air Infiltration Per Feature	144	CFM	Annual Heating Load Per Feature	21,241	kBtu/yr
Total Infiltration	144	CFM	Space Cooling Setpoint	72	°F
Cost to Plug Ventilation Structure	\$155		Space Heating Setpoint	72	°F
Cooling Energy Type	Electricity		Cooling Equipment Efficiency	9.2	EER
Heating Energy Type	Natural Gas		Heating Equipment Efficiency	88%	%
<u>Utilities Cost</u>			<u>Energy content per type</u>		
Electricity	\$0.20	kWh	Electricity	3.412	kBtu/kWh
Natural Gas	\$1.11	Therm	Natural Gas	100	kBtu/Therm
<u>Energy Savings</u>			<u>Cost Savings</u>		
Electricity	63	kWh/year	Electricity	\$ 12	/year
Natural Gas	241	Therm/year	Natural Gas	\$ 269	/year

Equations

$$\text{Airflow Through Leakage Area} = 2610 \times [\text{Gap Area}] \times [\text{Pressure Difference}]^{(0.5)}$$

$$\text{Annual Heating Load} = \{1.08 \times [\text{Airflow Through Leakage Area}] \times [(\text{Temp of Conditioned Space}) - (\text{Temp of Unconditioned Space})] \times [\text{annual heating hours}] / 1000\}$$

$$\text{Annual Cooling Load} = \{4.5 \times [\text{Airflow Through Leakage Area}] \times [(\text{Outside Air Enthalpy} - \text{Room Enthalpy})] \times [\text{annual cooling hours}] / 1000\}$$

$$\text{Annual Electricity Savings} = \{([\text{Annual Cooling Load Per Feature} \times \#\text{ of Features}] \times 1000) / [\text{Cooling Equipment Efficiency}]\}$$

$$\text{Annual Natural Gas Savings} = \{([\text{Annual Heating Load Per Feature}] \times \#\text{ of Features}) / [\text{Heating Energy Content}] / [\text{Heating Equipment Efficiency}]\}$$

* Please refer to [Appendix F](#) for the Weather BIN data calculation spreadsheet used to calculate heating/cooling hours and load

Rebates/Financial Incentives:

- None

Please see APPENDIX G for more information on Incentive Programs.

ECM #2: Install Low-Flow Aerators on All Building Faucets

The Anderson Building was found to have seven (7) bathroom faucets and a two (2) kitchen faucets equipped with aerators which were not of the low-flow variety. The higher flow aerators increase the energy consumption associated with domestic hot water production and increase water/sewer charges.

SWA recommends replacing the existing aerators with low-flow aerators to reduce the energy consumption associated with providing DHW to the occupants of the Anderson Building. The specific flow desired by the occupants of the Anderson Building or the Unitarian Society can influence the aerator selected but SWA has based the energy savings on a minimum of 25% reduction in total DHW requirements. To reduce the implementation cost of this measure it is assumed that building staff is able to quickly remove and replace the existing aerators with new low flow aerators. Before installing the new aerator building staff should inspect the faucets for any leaks and make the necessary repairs prior to the installation of this measure. Additional cost savings will be realized from the reduced water/sewer bills however, these savings were not incorporated into the analysis provided.

Installation Cost:

Estimated cost for nine (9) low-flow aerators is \$45.

Economics:

ECM #	ECM Description	Est. Installed Cost (\$)	Est. Incentives (\$)	Net Est. ECM Cost with Incentives (\$)	1st Yr Savings (kWh)	Demand Reduction/Mon (kW)	1st Yr Savings (Therms)	1st Yr Savings (kBtu/Sq FT)	Total 1st Yr Savings (\$)	Life of Measure (Yr)	Est. Lifetime Cost Savings (\$)	Simple Payback (Yr)	Lifetime Return on Investment (%)	Annual Return on Investment (%)	Internal Rate of Return (%)	Net Present Value (\$)	CO ₂ Reduced (lbs/Yr)
2	Install Low-Flow Aerators on All Building Faucets	\$45	\$0	\$45	0	0.0	29	0.3	\$32	10	\$321	1.4	613%	61%	71%	\$199	318

Assumptions:

Inputs	Existing		Proposed	
Type of Building	Elementary School			
Number of Occupants	40			
Daily Hot Water Consumption (gallons)	60			
Annual Occupied Days	260			
Energy Type	Natural Gas		Natural Gas	
Energy Conversion	100.000		100.000	
Boiler Efficiency	79%		79%	
Density of Water	8.34		lb/gal	
Annual Hot Water Consumption (gallons)	15,600	gallons	11,700	gallons
Entering Water Temperature	50	°F	50	°F
Exiting Water Temperature*	120	°F	120	°F
Utility Rate	\$1.113	\$/therms	\$1.113	\$/therms
DHW Energy Consumption	11,528	kBtu	8,646	kBtu
DHW Energy Consumption	115	therms	86	therms
Energy Cost	\$128		\$96	
Energy Cost Savings	\$32			
Low-Flow Percent Savings	25%			

Rebates/Financial Incentives:

- None

Please see APPENDIX G for more information on Incentive Programs.

ECM #3: Install Insulation on Hot Water Supply and Return for AHU 2

On inspection of the Air Handling Units it was apparent that a large section of the hot water piping to AHU 2 did not have insulation installed therefore significant heat loss was occurring to ambient air. Installing insulation will reduce heat loss and result in less natural gas being consumed to produce the same level of heating in the Fellowship Room, Hallway & Kitchen.

Using either in-house maintenance staff or a contracted tradesperson, install insulation on both supply and return sets of hot water piping for AHU 2. If in-house maintenance staff conduct the insulation then payback period will be reduced because pricing is based on contracted labor. It is recommended that 1" of 850°F Mineral Fiber insulation be installed.

Installation Cost:

Estimated Installed Cost: \$927 in total including \$486 of labor.

Economics:

ECM #	ECM Description	Est. Installed Cost (\$)	Est. Incentives (\$)	Net Est. ECM Cost with Incentives (\$)	1st Yr Savings (kWh)	Demand Reduction/Mon (kW)	1st Yr Savings (Therms)	1st Yr Savings (kBtu/Sq FT)	Total 1st Yr Savings (\$)	Life of Measure (Yr)	Est. Lifetime Cost Savings (\$)	Simple Payback (Yr)	Lifetime Return on Investment (%)	Annual Return on Investment (%)	Internal Rate of Return (%)	Net Present Value (\$)	CO ₂ Reduced (lbs/Yr)
3	Install Insulation on Hot Water Supply and Return for AHU 2	\$927	\$0	\$927	0	0.0	474	5.7	\$528	10	\$5,279	1.8	469%	47%	56%	\$3,091	5,230

Assumptions:

Type	Location	Process Temp (°F)	Pipe Diameter (in)	Uninsulated Length (ft)	Recommended Insulation Thickness (in)	Heat Loss w/o Insulation ¹ (Btu/hr/ft)	Heat Loss w/ Insulation ¹ (Btu/hr/ft)	Annual Hours of Operation	Total Cost to Insulate	Energy Savings (kBtu/yr)	\$ Savings
Hot Water Supply	AHU 2	172	2	40	1	116.5	19.17	5,507	\$463.60	24,363	\$271.09
Hot Water Return	AHU 2	168	2	40	1	110.5	18.29	5,507	\$463.60	23,082	\$256.83

Assumptions

Est. Annual Heating Hours	5,507	Boiler Efficiency	88%	%
Ambient Space Temperature	75 °F	Natural Gas Energy Content	100	kBtu / Therm
Existing Insulation Type	None	Natural Gas Rate	\$1.11	per Therm

¹ Heat loss values and savings estimate were generated by 3E Plus, a pipe insulation calculator developed by the North American Insulating Manufacturers Association (NAIMA). Software is available at www.pipeinsulation.org

Equations

$$\text{Energy Savings (kBtu)} = \{([\text{Heat Loss w/o Insulation}] - [\text{Heat Loss w/ Insulation}]) \times [\text{Uninsulated Length}] \times [\text{Estimated Annual Heating Hours}]\} / 1000$$

$$\text{Total Cost to Insulate} = [\text{Uninsulated Length}] \times [\text{Unit Cost to Insulate}]$$

$$\text{Annual Savings} = ([\text{Energy Savings}] / [\text{Steam Energy Content}]) \times [\text{Steam Rate}]$$

$$\text{Est. Implementation Cost} = [\text{Sum of Total Costs to Insulate}]$$

Supply Insulation:

NAIMA 3EPlus V4.1

Steven Winter Associates
307 7th Avenue
New York, NY 10001
2125645800

Item ID = AHU 2 - HHW Piping Insulation
Item Description = Insulate Hot Water Supply and Return Piping
System Application = Pipe - Horizontal
Dimensional Standard = ASTM C 585 Rigid
Calculation Type = Heat Loss Per Hour Report
Process Temperature = 172
Ambient Temperature = 75.0
Wind Speed = 0.0
Nominal Pipe Size = 2
Bare Metal = Copper
Bare Surface Emittance = 0.6
Insulation Layer 1 = 850F Mineral Fiber PIPE, Type I, C547-11
Outer Jacket Material = All Service Jacket
Outer Surface Emittance = 0.9

Variable Insulation Thickness	Surface Temp (°F)	Heat Loss (BTU/hr/ft)	Efficiency (%)
Bare	172.0	116.50	
Layer 1 (1.0)	85.6	19.17	83.54

Return Insulation:

NAIMA 3EPlus V4.1

Steven Winter Associates
307 7th Avenue
New York, NY 10001
2125645800

Item ID = AHU 2 - HHW Piping Insulation
Item Description = Insulate Hot Water Supply and Return Piping
System Application = Pipe - Horizontal
Dimensional Standard = ASTM C 585 Rigid
Calculation Type = Heat Loss Per Hour Report
Process Temperature = 168
Ambient Temperature = 75.0
Wind Speed = 0.0
Nominal Pipe Size = 2
Bare Metal = Copper
Bare Surface Emittance = 0.6
Insulation Layer 1 = 850F Mineral Fiber PIPE, Type I, C547-11
Outer Jacket Material = All Service Jacket
Outer Surface Emittance = 0.9

Variable Insulation Thickness	Surface Temp (°F)	Heat Loss (BTU/hr/ft)	Efficiency (%)
Bare	168.0	110.50	
Layer 1 (1.0)	85.2	18.29	83.45

Rebates/Financial Incentives:

- None

Please see APPENDIX G for more information on Incentive Programs.

ECM #4: Install Weather-stripping on the Front Doors with Door Sweeps

The Anderson Building has two sets of doors on the front of the building. It was observed during the audit walk through that both sets of doors were deficient in weather-stripping, particularly at the base of the doors. The gaps in the doors allow unwanted air infiltration and heat transfer between conditioned indoor spaces and the outdoors resulting in increased energy consumption and the spaces being less comfortable.

Using either in-house maintenance staff or a contracted tradesperson, install door sweeps on both sets of front doors. Before having these installed it is recommended that in house maintenance ensure door is in good alignment allow easy installation.

Installation Cost:

Estimated Installed Cost: \$200 per door.

Economics:

ECM #	ECM Description	Est. Installed Cost (\$)	Est. Incentives (\$)	Net Est. ECM Cost with Incentives (\$)	1st Yr Savings (kWh)	Demand Reduction/Mon (kW)	1st Yr Savings (Therms)	1st Yr Savings (kBtu/Sq FT)	Total 1st Yr Savings (\$)	Life of Measure (Yr)	Est. Lifetime Cost Savings (\$)	Simple Payback (Yr)	Lifetime Return on Investment (%)	Annual Return on Investment (%)	Internal Rate of Return (%)	Net Present Value (\$)	CO ₂ Reduced (lbs/Yr)
4	Install Weather-Stripping and Door Sweeps on the Front Doors	\$400	\$0	\$400	45	0.0	172	2.1	\$201	5	\$1,004	2.0	151%	30%	35%	\$336	1,981

Assumptions: SWA calculated the heating and cooling loads using Bin data analysis.

gap area	20	sqin	heating setpoint T	72	F	cooling setpoint T	72	F
pressure diff	0.02	in wc	night/weekend heating enabled <	45	F	relative humidity	50%	%
est. infiltration	51.27	CFM	night/weekend cooling enabled >	85	F	room enthalpy	26.39	btu/lb
heating enabled <	60	F	total heating hours	3,411	Hrs	total cooling hours	192	Hrs
cooling enabled >	65	F	heating load	7,586	kBtu/year	cooling load	208	kBtu/year

Assumptions

# Doors Requiring Weatherstripping	2		Annual Cooling Hours	192	
Gap Area Per Unit	20	in ²	Annual Heating Hours	3,411	
Pressure Difference	0.02	in. wc	Annual Cooling Load Per Door	208	kBtu/yr
Air Infiltration Per Door	51	CFM	Annual Heating Load Per Door	7,586	kBtu/yr
Total Infiltration	103	CFM	Space Cooling Setpoint	72	°F
Cost per door	\$200		Space Heating Setpoint	72	°F
Cooling Energy Type	Electricity		Cooling Equipment Efficiency	9	EER
Heating Energy Type	Natural Gas		Heating Equipment Efficiency	70%	%
<u>Utilities Cost</u>			<u>Energy content per type</u>		
Electricity	\$0.20	kWh	Electricity	3.412	kBtu/kWh
Natural Gas	\$1.11	Therm	Natural Gas	100	kBtu/Therm
<u>Energy Savings</u>			<u>Cost Savings</u>		
Electricity	46	kWh/year	Electricity	\$ 9	/year
Natural Gas	217	Therm/year	Natural Gas	\$ 241	/year

Equations

$$\text{Airflow Through Leakage Area} = 2610 \times [\text{Gap Area}] \times [\text{Pressure Difference}]^{(0.5)}$$

$$\text{Annual Heating Load} = \{1.08 \times [\text{Airflow Through Leakage Area}] \times ([\text{Temp of Conditioned Space}] - [\text{Temp of Unconditioned Space}]) \times [\text{annual heating hours}] / 1000\}$$

$$\text{Annual Cooling Load} = \{4.5 \times [\text{Airflow Through Leakage Area}] \times [(\text{Outside Air Enthalpy} - \text{Room Enthalpy})] \times [\text{annual cooling hours}] / 1000\}$$

$$\text{Annual Electricity Savings} = (([\text{Annual Cooling Load Per Door}] \times [\# \text{ of Doors}]) \times 1000) / [\text{Cooling Equipment Efficiency}]$$

$$\text{Annual Natural Gas Savings} = (([\text{Annual Heating Load Per Door}] \times [\# \text{ of Doors}]) / [\text{Heating Energy Content}]) / [\text{Heating Equipment Efficiency}]$$

* Please refer to [Appendix F](#) for the Weather BIN data calculation spreadsheet used to calculate heating/cooling hours and load

Rebates/Financial Incentives:

- None

Please see APPENDIX G for more information on Incentive Programs.

ECM #5: Replace High Pressure Sodium, Incandescent and Fluorescent Lamps with LED

Many of the lamps in the Anderson Building were found to be incandescent lamps, T8 lamps fluorescent lamps and high pressure sodium (HPS) lamps ranging from 32-100 watts. Incandescent lamps, T8 lamps fluorescent lamps and HPS lamps are an inefficient means of lighting a space or the exterior of the building. Modern LED lamps of 9.5 watts can replace a 60 watt incandescent lamp without loss in lumen output or color quality. In addition, LED lamps have lifespans of 50,000 hours, compared with 1,000 to 2,000 hours for incandescent lamps. Similar reductions in wattage and increases in lifespan are experienced when replacing the T8s and HPS lamps with LED equivalents. It is recommended that current fixtures continue to be used but that new LED lamps replace the existing inefficient ones.

Using either in-house maintenance staff or a contracted electrician, replace all incandescent, T8 and HPS lamps with an LED equivalents.

Installation Cost:

Estimated Installed Cost: \$2,907 (Includes \$738 of Labor)

Source of Cost Estimate: RS Means, Published and Established Costs

Economics:

ECM #	ECM Description	Est. Installed Cost (\$)	Est. Incentives (\$)	Net Est. ECM Cost with Incentives (\$)	1st Yr Savings (kWh)	Demand Reduction/Mon (kW)	1st Yr Savings (Therms)	1st Yr Savings (kBtu/Sq FT)	Total 1st Yr Savings (\$)	Life of Measure (Yr)	Est. Lifetime Cost Savings (\$)	Simple Payback (Yr)	Lifetime Return on Investment (%)	Annual Return on Investment (%)	Internal Rate of Return (%)	Net Present Value (\$)	CO ₂ Reduced (lbs/Yr)
5	Replace High Pressure Sodium, Incandescent and Fluorescent Lamps with LED	\$2,907	\$350	\$2,557	6,076	5.3	0	2.5	\$1,199	10	\$11,991	2.1	369%	37%	45%	\$6,581	10,880

Assumptions: SWA calculated the savings for this measure using measurements taken on the day of the field visit and using the billing analysis. Refer to Lighting Study on Appendix B for further information.

<i>Assumptions</i>			
Average Electric Rate	\$0.20 \$/kWh	# of Summer Months	5
Average Summer Demand Rate	\$0.00 \$/kW/month	# of Winter Months	7
Average Winter Demand Rate	\$0.00 \$/kW/month		
<i>Existing</i>			
Lamp Type	T-8s, HPS, incandescent	Lamp Type	LEDs
Operational Hours per Week	Varies - See Chart	Operational Hours per Week	Varies - See Chart
Operational Hours per Year	Varies - See Chart	Operational Hours per Year	Varies - See Chart
Total kW	12.5	Total kW	7.2
Annual Energy Use (kWh)	13295	Annual Energy Use (kWh)	7218
Rated Hours Per Lamp	Varies	Rated Hours Per Lamp	Varies
Annual Electric Cost	\$2,623.53	Annual Electric Cost	\$1,424.47
		Total Kilowatts Saved (KW)	5.3
		Total Energy Saved (kWh)	6076.2
		Total Cost Savings	\$1,199.06
<i>Equations</i>			
Total operating hours = ([Hrs / weekday] x [5 Days / week] x [52 weeks / year]) + ([Hrs/weekend] x [2 days/week] x [52 weeks / year])			
# of fixtures = [from field survey]			
Annual Energy Use (kWh) = [wattage of fixture] x [# of fixtures] x [total operating hours] / 1000			
Electricity cost for fixture type = {[\$ / kWh] x [annual kWh for fixture type]} + [Total kW x demand cost summer x 5 months] + [Total kW x demand cost winter x 7 months]			
Estimated Implementation Cost = {[Material Cost Per Fixture] x [Installation Cost Per Fixture] x [# of fixtures]}			
Annual Savings = {[Existing Annual Electric Cost] - [Proposed Annual Electric Cost]} + [Estimated Maintenance Cost]			

Installation Costs are based on R.S. Means values. Materials costs are from either R.S. Means, manufacturers quote, or 100Bulbs costs.

Dimmable 11 Watt LED by CREE replace for 60 Watt incandecent:
<https://www.1000bulbs.com/product/136362/CREE-08027OMF3M.html>

Dimmable 13.5 Watt LED by CREE replace for 75 Watt incandecent: <https://www.1000bulbs.com/product/118041/CREE-11027OMF2.html>

18W LED is a 32W T-8 replacement by Denkyu:
http://www.lighting-spot.com/led-t8-tube-6000k-18-watt-100-277v.html?fee=9&fep=7406&gclid=CPmyw_muxsQCFYE7gQod1kEAsw

Dimmable 18 Watt LED by CREE replace for 100 Watt incandecent:
<https://www.1000bulbs.com/product/118039/CREE-16027OMF2.html>

18 Watt LED by VIRIBRIGHT replacement for 70 Watt HP Sodium
<https://www.1000bulbs.com/product/117622/VIBRI-73532.html>

Installation Labor costs are based on estimated 6 fixtures per hour and \$60 per hour labor rate, equal to \$6.00 per fixture

Rebates/Financial Incentives:

- NJ Clean Energy – SmartStart Program –\$5/each, or a total of \$350 for 70 LED lamps

Please see APPENDIX G for more information on Incentive Programs.

PROPOSED FURTHER RECOMMENDATIONS

Capital Improvements

Capital improvements are recommendations for the building that may not be cost-effective at the current time, but that could yield a significant long-term payback. These recommendations should typically be considered as part of a long-term capital improvement plan. Capital improvements should be considered if additional funds are made available. Additionally, incentives are available for both recommendations below and should be sought after if implementation is considered. SWA recommends the following capital improvements for Anderson Building.

- Replace the Existing Boilers with New Gas Fired Boilers – The Anderson Building is currently heated using two (2) gas-fired hot water boilers which were installed during the 1996 building renovation. The boilers are high efficiency with a rating of 88% according to design specification. However, due to their age it is believed that these boilers are not functioning at their original design efficiency.

SWA recommends replacing the boilers with new, gas-fired boilers of similar design when the existing boilers fail. Replacing the boilers before failure is not currently recommended because the existing boilers are high efficiency and the payback on the replacement is lengthy. For the purposes of calculations and providing a conservative estimate it was assumed that new gas-fired hot water boilers would have 2% higher efficiency than the current boilers in their existing condition. It was calculated that replacing the boilers would cost \$57,323 including removal/demolition of old boilers, purchase of new boilers and installation. The new boilers would generate a savings of \$111 a year with reduced natural gas consumption and a payback period of 515 years.

- Replace the Split AC Units with New High Efficiency Split AC Units - The building is currently cooled by three (3) split AC units which were installed during the 1996 building renovation. The units have design efficiency EER ratings of 9.2.

It is recommended that upon failure the existing AC split units be replaced with higher efficiency units. Due to the high capital cost in replacing units it is not recommended until it is required. SWA estimates that the replacement of these units will cost \$112,050 and result in saving \$1,378 per year in electricity costs. As a result the payback period of 81 years. Below, SWA has provided more detailed information.

Installation Cost:

Estimated Installed Cost: \$112,050 (Includes \$30,159 of Labor)

Source of Cost Estimate: RS Means, Published and Established Costs

Economics:

ECM #	ECM Description	Est. Installed Cost (\$)	Est. Incentives (\$)	Net Est. ECM Cost with Incentives (\$)	1st Yr Savings (kWh)	Demand Reduction/Mon (kW)	1st Yr Savings (Therms)	1st Yr Savings (kBtu/Sq Ft)	Total 1st Yr Savings (\$)	Life of Measure (Yr)	Est. Lifetime Cost Savings (\$)	Simple Payback (Yr)	Lifetime Return on Investment (%)	Annual Return on Investment (%)	Internal Rate of Return (%)	Net Present Value (\$)	CO ₂ Reduced (lbs/Yr)
CI	Install High Efficiency A/C Units	\$112,050	\$4,345	\$107,705	3,514	38.6	0	1.5	\$693	15	\$10,402	155.3	-90%	-6%	-23%	-\$96,963	6,292

Assumptions:

Inputs (Cooling)		
Cooling Activation Temp	65	°F
Peak Capacity Temperature	90	°F
Peak Cooling Capacity	100%	%
Minimum Capacity Temperature	65	°F
Minimum Cooling Capacity	50%	%
Electric Conversion	3,412	Btu/kWh
Cost of Electric	\$0.20	\$/kWh

AC Unit Specifications			
Condition	Unit	Cooling Capacity (Tons/Unit)	Cooling Efficiency (EER)
Baseline	AC #1	20	9.2
	AC #2	20	9.2
	AC #3	15	9.2
Proposed	AC #1	20	12.0
	AC #2	20	12.0
	AC #3	15	10.8

Equations

Elec Consumption = (12 / EER) x (Cooling Capacity %) x (# of Units) x (RTU Capacity)
 Annual Savings = [Electric Savings] x [Electric Rate]
 Simple Payback = [Annual Savings] / [Est. Costs for Implementation]

Temp Boundaries Low Temp (°F)	High Temp (°F)	Bin Data												AC Unit Operation				Baseline Electric (kWh)	Proposed Electric (kWh)	Savings Electric (kWh)	Cost Savings (\$)
		AC #1 - Anderson Auditorium			AC #2 - Fellowship Rm, Hallway & Kitchen			AC #3 - Basement			Cooling Activation	Cooling Capacity	AC #1 - Cooling Capacity	AC #2 - Cooling Capacity	AC #3 - Cooling Capacity						
Hrs Dry Bulb (Daytime)	Hrs Dry Bulb (Nighttime)	Hrs Dry Bulb (Weekend)	Hrs Dry Bulb (Daytime)	Hrs Dry Bulb (Nighttime)	Hrs Dry Bulb (Weekend)	Hrs Dry Bulb (Daytime)	Hrs Dry Bulb (Nighttime)	Hrs Dry Bulb (Weekend)	Hrs Dry Bulb (Daytime)	Hrs Dry Bulb (Nighttime)	Hrs Dry Bulb (Weekend)										
94.0	96.0	1	0	0	1	0	1	0	6	0	1	Y	100%	20.0	20.0	15.0	215.2	176.7	38.6	88	
92.0	94.0	2	0	2	2	0	0	0	7	0	2	Y	100%	20.0	20.0	15.0	332.6	270.0	62.6	112	
90.0	92.0	1	1	1	1	1	1	0	7	0	1	Y	100%	20.0	20.0	15.0	287.0	233.3	53.6	111	
88.0	90.0	3	2	0	4	3	1	1	18	0	1	Y	98%	19.6	19.6	14.7	696.7	565.1	131.5	526	
86.0	88.0	1	2	0	2	3	0	17	0	1	Y	94%	18.8	18.8	14.1	577.2	432.4	144.8	519		
84.0	86.0	9	4	2	12	6	1	47	0	4	Y	90%	18.0	18.0	13.5	1696.3	1377.0	319.3	563		
82.0	84.0	3	2	2	6	2	3	39	0	5	Y	89%	17.2	17.2	12.9	1144.2	904.3	239.9	540		
80.0	82.0	5	2	5	11	7	4	43	0	10	Y	82%	16.4	16.4	12.3	1599.0	1298.3	300.7	559		
78.0	80.0	1	6	4	4	13	5	45	0	10	Y	78%	15.6	15.6	11.7	1510.8	1258.8	251.9	555		
76.0	78.0	6	2	8	10	4	4	58	0	13	Y	74%	14.8	14.8	11.1	1394.7	1132.2	262.5	552		
74.0	76.0	9	3	9	12	8	8	71	0	19	Y	70%	14.0	14.0	10.5	2127.4	1756.0	371.4	577		
72.0	74.0	13	4	9	24	5	2	105	0	16	Y	66%	13.2	13.2	9.9	2543.9	2083.4	460.5	591		
70.0	72.0	4	15	5	13	23	5	86	0	14	Y	62%	12.4	12.4	9.3	2364.3	1893.3	475.0	584		
68.0	70.0	11	16	2	21	27	4	92	0	11	Y	58%	11.6	11.6	8.7	2394.4	1935.3	459.1	591		
66.0	68.0	0	0	9	0	0	0	0	0	0	Y	54%	10.8	10.8	8.1	126.8	97.2	29.6	56		
64.0	66.0	0	0	5	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
62.0	64.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
60.0	62.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
58.0	60.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
56.0	58.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
54.0	56.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
52.0	54.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
50.0	52.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
48.0	50.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
46.0	48.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
44.0	46.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
42.0	44.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
40.0	42.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
38.0	40.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
36.0	38.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
34.0	36.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
32.0	34.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
30.0	32.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
28.0	30.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
26.0	28.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
24.0	26.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
22.0	24.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
20.0	22.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
18.0	20.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
16.0	18.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
14.0	16.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
12.0	14.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
10.0	12.0	0	0	0	0	0	0	0	0	0	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Totals		69	60	63	133	102	38	621	0	108						18,866	15,346	3,514	\$693		

Rebates/Financial Incentives:

- Total Incentive = \$4,345

Please see APPENDIX G for more information on Incentive Programs.

Operations and Maintenance

Operations and Maintenance measures consist of low/no cost measures that are within the capability of the current building staff to handle. These measures typically require little investment, and they yield a short payback period. These measures may address equipment settings or staff operations that, when addressed will reduce energy consumption or costs.

- Purchase Energy Star® Rated Appliances - SWA recommends that the building consider purchasing the most energy-efficient equipment, including ENERGY STAR® labeled appliances, when equipment is installed or replaced. ENERGY STAR® appliances meet stricter standards compared to standard appliances. Stricter standards include exceeding Federal minimum efficiencies and reduced environmental impact. More information can be found in the “Products” section of the ENERGY STAR® website at: <http://www.energystar.gov>. Specifically, an energy savings calculator for replacing the refrigerator and oven located in the kitchen at Anderson Building with Energy Star rated appliances can be found at: <https://www.energystar.gov/products/certified-products/detail/commercial-refrigerators-freezers> and <https://www.energystar.gov/products/certified-products/detail/commercial-ovens>.

APPENDIX A: EQUIPMENT LIST

Building System	Description	Model #	Fuel	Location	Space Served	Year Installed	Estimated Remaining Useful Life %
Heating	Lochnivar Power-Fin Boiler Capacity - 750,000 Btu/hr Efficiency - 88%	Model # - PBN075 Serial # - B972541	Natural Gas	2nd Floor	Whole Building	1996	5%
Heating	Lochnivar Power-Fin Boiler Capacity - 750,000 Btu/hr Efficiency - 88%	Model # - PBN075 Serial # - B972542	Natural Gas	2nd Floor	Whole Building	1996	5%
Cooling / Heating	Lennox Furnace Heater / Split AC Capacity - CNV Efficiency - CNV	Model # - CB30M - 41 - 1P Serial # - 5896L 24655	Natural Gas	Basement	Basement	1996	5%
DHW	Bradford White Capacity - 50 Gal Input - 42,000 (Btu/hr)	Model # - DS150S6FBN Serial # - EJ11122504	Natural Gas	2nd Floor	Whole Building	1996	-90%
Cooling	Lennox Split Unit Cooling Capacity - 20 Ton Cooling Efficiency - 9.2 EER Heating Capacity - CNV	Evap. Model # - CB17-275-V-1 Evap. Serial # - 5696J00979 Cond. Model # - LSA240C-1Y Cond. Serial # - 5699E09848	Electric	2nd Floor / Exterior	Anderson Auditorium	1996	-27%
Cooling	Lennox Split Unit Cooling Capacity - 20 Ton Cooling Efficiency - 9.2 EER Heating Capacity - CNV	Evap. Model # - CB17-275-V-1 Evap. Serial # - 5696J04549 Cond. Model # - LSA240C-1Y Cond. Serial # - 5699D04208	Electric	2nd Floor / Exterior	Fellowship Rm, Hallway & Kitchen	1996	-27%
Cooling	Lennox Split Unit Cooling Capacity - 15 Ton Cooling Efficiency - 9.2 EER Heating Capacity - CNV	Evap. Model # - CBH17-185-V-1 Evap. Serial # - 5696L06012 Cond. Model # - LSA180C-1Y Cond. Serial # - 5699E09838	Electric	2nd Floor / Exterior	Basement	1996	-27%
HW Pump	Bell & Gossett Pump RPM - 1725 Power - 1 HP	Model # - 903585 Serial # - 7VE48T17D163D P	Electric	2nd Floor	Whole Building	1996	5%
HW Pump	Bell & Gossett Pump RPM - 1725 Power - 1 HP	Model # - 903585 Serial # - FVC 48T17D177B P	Electric	2nd Floor	Whole Building	1996	5%

Note: The remaining useful life of a system (in %) is an estimate based on the system date of built and existing conditions derived from visual inspection.

APPENDIX B: LIGHTING STUDY

Existing Fixtures

Space Data (optional)						Existing Lighting Equipment											
#	Building	Level/Floor	Room Number	Room Type	Measured Lighting Level (FC)	Lamp Type	Lamp Wattage	# lamps per fixture	Ballast Type	Fixture Wattage	Fixture Quantity	Hrs/Day [weekday]	Hrs/Day [weekend]	Months used per year	Controls	Control Qty.	Annual Energy Use [kwh/year]
1	USR Church	1	Anderson Auditorium		N/a	LED_Lamp	2W_Retrofit_90	1	n/a	12	54	1.5	3	12	Switch	1	419.9
2	USR Church	1	Anderson Auditorium		N/a	LED_Lamp	1W_Retrofit_50	1	n/a	8	21	1.5	3	12	Switch	1	108.9
3	USR Church	1	Anderson Auditorium		N/a	Exit Sign				5	2	24	24	12	None	0	80.6
4	USR Church	1	Auditorium Table Storage Rm		N/a	T8_Fluorescent	32W	4	Electronic	106.7	2	0	0.25	12	Switch	1	5.1
5	USR Church	1	etween auditorium and Fellowship Rm		N/a	CFL_Screw_In	13W	2	n/a	26	5	2.5	5	12	Switch	1	140.4
6	USR Church	1	etween auditorium and Fellowship Rm		N/a	LED Exit Sign		1	n/a	5	2	24	24	12	None	0	80.6
7	USR Church	1	Bible/Coat Storage Rm		N/a	T8_Fluorescent	32W	2	Electronic	62	3	0	0.25	12	Switch	1	4.5
8	USR Church	1	Fellowship Rm		N/a	Incandescent	60W	5	n/a	350	8	3	2	12	Switch	2	2553.6
9	USR Church	1	Fellowship Rm		N/a	Incandescent	75W	1	n/a	75	22	3	2	12	Switch	2	1504.8
10	USR Church	1	Fellowship Rm		N/a	LED Exit Sign	5W			5	2	24	24	12	None	0	80.6
11	USR Church	1	Utility Closet		N/a	T8_Fluorescent	32W	2	Electronic	62	1	0	0.125	12	Switch	1	0.7
12	USR Church	1	Kitchen		N/a	T8_Fluorescent	32W	4	Electronic	106.7	8	0.5	1	12	Switch	1	184.4
13	USR Church	1	Kitchen		N/a	LED Exit Sign				5	2	24	24	12	None	0	80.6
14	USR Church	1			N/a												
15	USR Church	2	Childrens Room		N/a	T8_Fluorescent	32W	1	Electronic	33.2	3	0	1	12	Switch	1	9.6
16	USR Church	2	HVAC AHU Rm 2		N/a	T8_Fluorescent	32W	1	Electronic	33.2	5	0	0.125	12	Switch	1	2.0
17	USR Church	0-2	Stairwell		N/a	CFL_Screw_In	15W	1	n/a	15	5	12	12	12	Switch	1	302.4
18	USR Church	0-2	Stairwell		N/a	Circline_Lamp	32W_T9	1	Magnetic	40	2	12	12	12	Switch	1	322.6
19	USR Church	0-2	Stairwell		N/a	LED Exit Sign				5	1	24	24	12	None	0	40.3
20	USR Church	0	Nursery Classroom		N/a	T8_U_Shaped_Fluorescent	32W	2	Electronic	65	15	8	3	12	Switch	1	2152.8
21	USR Church	0	Nursery Classroom		N/a	LED Exit Sign				5	2	24	24	12	None	0	80.6
22	USR Church	0	allway between front and back		N/a	T8_U_Shaped_Fluorescent	32W	2	Electronic	65	2	8	3	12	Switch	1	287.0
23	USR Church	0	allway between front and back		N/a	LED Exit Sign				5	1	24	24	12	None	0	40.3
24	USR Church	0	Kitchen & children meal area		N/a	T8_U_Shaped_Fluorescent	32W	2	Electronic	65	8	8	3	12	Switch	1	1148.2
25	USR Church	0	Kitchen & children meal area		N/a	LED Exit Sign				5	2	24	24	12	None	0	80.6
26	USR Church	0	Front nursery play area		N/a	T8_U_Shaped_Fluorescent	32W	2	Electronic	65	11	6	0	12	Switch	1	1029.6
27	USR Church	0	Front nursery play area		N/a	LED Exit Sign				5	1	24	24	12	None	0	40.3
28	USR Church	0	Front nursery play area		N/a	T8_Fluorescent	32W	1	Electronic	33.2	1	6	0	12	Switch	1	47.8
29	USR Church	0	ce/Kitchen/Hallway near nursery		N/a	Circline_Lamp	32W_T9	1	Magnetic	40	3	2	2	12	Switch	1	80.6
30	USR Church	0	ce/Kitchen/Hallway near nursery		N/a	LED Exit Sign				5	2	24	24	12	None	0	80.6
31	USR Church	0	ce/Kitchen/Hallway near nursery		N/a	T8_Fluorescent	32W	1	Electronic	33.2	1	1	2	12	Switch	1	14.3
32	USR Church	0	Mens bathroom		N/a	T8_Fluorescent	32W	4	Electronic	106.7	1	1	1	12	Switch	1	35.9
33	USR Church	0	Mens bathroom		N/a	T8_Fluorescent	32W	2	Electronic	62	1	1	1	12	Switch	1	20.8
34	USR Church	0	Womens bathroom		N/a	T8_Fluorescent	32W	4	Electronic	106.7	1	1	1	12	Switch	1	35.9
35	USR Church	0	Womens bathroom		N/a	T8_Fluorescent	32W	2	Electronic	62	1	1	1	12	Switch	1	20.8
36	USR Church	0	Boys bathroom		N/a	T8_U_Shaped_Fluorescent	32W	2	Electronic	65	1	8	3	12	Switch	1	143.5
37	USR Church	0	Girls bathroom		N/a	T8_U_Shaped_Fluorescent	32W	2	Electronic	65	1	8	3	12	Switch	1	143.5
38	USR Church	0	Hallway outside bathroom		N/a	CFL_Screw_In	15W	2	n/a	30	2	8	3	12	Switch	1	132.5
39	USR Church	0	Hallway outside bathroom		N/a	LED Exit Sign				5	1	24	24	12	None	0	40.3
40	USR Church	1	External building walls		N/a	CFL_Screw_In	13W	1	n/a	13	15	5	5	12	Autom. Timer	1	245.7
41	USR Church	1	ighting for stainglass South& North side		N/a	Incandescent	100W	1	n/a	100	3	5	5	12	Autom. Timer	1	378.0
42	USR Church	1	al lighting for stainglass South side		N/a	Incandescent	75W	1	n/a	75	2	5	5	12	Autom. Timer	1	189.0
43	USR Church	1	ternal path lights on North Side		N/a	High_Pressure_Sodium	70W	1	Magnetic	91	3	5	5	12	Autom. Timer	1	344.0
44	USR Church	1	ternal path lights on North Side		N/a	CFL_Screw_In	60W	1	n/a	60	1	5	5	12	Autom. Timer	1	75.6
45	USR Church	1	Entrance vestibule		N/a	LED_Lamp	2W_Retrofit_90	1	n/a	12	1	0	1	12	Switch	1	1.2
46	USR Church	1	Entrance vestibule		N/a	Halogen	90W	1	Electronic	95	5	0	1	12	Switch	1	45.6
47	USR Church	1	Entrance vestibule		N/a	LED Exit Sign	5W	1	n/a	5	1	24	24	12	None	0	40.3
48	USR Church	1	Aditorium Storage Closet		N/a	T8_Fluorescent	32W	4	Electronic	106.7	1	0	0.125	12	Switch	1	1.3
49	USR Church	1	Aditorium Storage Closet		N/a	Incandescent	60W	1	n/a	60	1	0	0.125	12	Switch	1	0.7
50	USR Church	1	Bathroom		N/a	T8_Fluorescent	32W	2	Electronic	62	1	1	1	12	Switch	1	20.8
51	USR Church	2	Stairwell Closet		N/a	T8_Fluorescent	32W	3	Electronic	86.2	1	0	0.125	12	Switch	1	1.0
52	USR Church	2	HVAC AHU Rm 1		N/a	T8_Fluorescent	32W	1	Electronic	33.2	3	0	0.125	12	Switch	1	1.2
53	USR Church	0	Electrical Closet		N/a	T8_Fluorescent	32W	1	Electronic	33.2	2	0	0.125	12	Switch	1	0.8
54	USR Church	1	side - Car Park (street light style)		N/a	High_Pressure_Sodium	250W	1	n/a	295	1	5	5	12	Autom. Timer	1	371.7

Proposed Fixtures – Replacements are Highlighted Below

#	Building	Level/Floor	Room Number	Room Type	Measured Lighting Level (FC)	Lamp Type	Lamp Wattage	# lamps per fixture	Ballast Type	Fixture Wattage	Fixture Quantity	Proposed Controls	Control Qty.	Annual Energy Use [kwh/year]	Total Energy Savings [kWh]	Demand Savings [kW]	Total Savings[\$]	Material Cost	Installation Cost	Years
1	USR Church	1	Anderson Auditorium	N/A	N/A	LED_Lamp	RAB_12W_Retrofit_90WPAR	1	n/a	12	54	Switch	1	419.9	0.0	0.0	\$0.00			
2	USR Church	1	Anderson Auditorium	N/A	N/A	LED_Lamp	RAB_8W_Retrofit_50WPAR	1	n/a	8	21	Switch	1	108.9	0.0	0.0	\$0.00			
3	USR Church	1	Anderson Auditorium	N/A	N/A	Exit Sign		0	0	5	2	None	0	80.6	0.0	0.0	\$0.00			
4	USR Church	1	Auditorium Table Storage Rm	N/A	N/A	T8_Fluorescent	32W	4	Electronic	106.7	2	Switch	1	5.1	0.0	0.0	\$0.00			
5	USR Church	1	etween auditorium and Fellowship Rm	N/A	N/A	CFL_Screw_In	13W	2	n/a	26	5	Switch	1	140.4	0.0	0.0	\$0.00			
6	USR Church	1	etween auditorium and Fellowship Rm	N/A	N/A	LED Exit Sign		1	n/a	5	2	None	0	80.6	0.0	0.0	\$0.00			
7	USR Church	1	Bible/Coat Storage Rm	N/A	N/A	T8_Fluorescent	32W	2	Electronic	62	3	Switch	1	4.5	0.0	0.0	\$0.00			
8	USR Church	1	Fellowship Rm	N/A	N/A	LED_Lamp	LED 11W Replacement	5	n/a	55	8	Switch	2	401.3	2152.3	2.4	\$424.73	\$392.00	\$240.00	1.5
9	USR Church	1	Fellowship Rm	N/A	N/A	LED_Lamp	LED 13.5W Replacement	1	n/a	13.5	22	Switch	2	270.9	1233.9	1.4	\$243.50	\$351.34	\$132.00	2.0
10	USR Church	1	Fellowship Rm	N/A	N/A	LED Exit Sign		0	0	5	2	None	0	80.6	0.0	0.0	\$0.00			
11	USR Church	1	Utility Closet	N/A	N/A	T8_Fluorescent	32W	2	Electronic	62	1	Switch	1	0.7	0.0	0.0	\$0.00			
12	USR Church	1	Kitchen	N/A	N/A	T8_Fluorescent	32W	4	Electronic	106.7	8	Switch	1	184.4	0.0	0.0	\$0.00			
13	USR Church	1	Kitchen	N/A	N/A	LED Exit Sign		0	0	5	2	None	0	80.6	0.0	0.0	\$0.00			
14	USR Church	1		N/A	N/A			0	0	0	0	0	0							
15	USR Church	2	Childrens Room	N/A	N/A	T8_Fluorescent	32W	1	Electronic	33.2	3	Switch	1	9.6	0.0	0.0	\$0.00			
16	USR Church	2	HVAC AHU Rm 2	N/A	N/A	T8_Fluorescent	32W	1	Electronic	33.2	5	Switch	1	2.0	0.0	0.0	\$0.00			
17	USR Church	0-2	Stairwell	N/A	N/A	CFL_Screw_In	15W	1	n/a	15	5	Switch	1	302.4	0.0	0.0	\$0.00			
18	USR Church	0-2	Stairwell	N/A	N/A	Circline_Lamp	32W_T9	1	Magnetic	40	2	Switch	1	322.6	0.0	0.0	\$0.00			
19	USR Church	0-2	Stairwell	N/A	N/A	LED Exit Sign		0	n/a	5	1	None	0	40.3	0.0	0.0	\$0.00			
20	USR Church	0	Nursery Classroom	N/A	N/A	LED_Lamp	LED 18W Replacement	1	Electronic	36	15	Switch	1	1192.3	960.5	0.4	\$189.54	\$570.00	\$90.00	3.5
21	USR Church	0	Nursery Classroom	N/A	N/A	LED Exit Sign		0	0	5	2	None	0	80.6	0.0	0.0	\$0.00			
22	USR Church	0	lallway between front and back	N/A	N/A	T8_U_Shaped_Fluorescent	32W	2	Electronic	65	2	Switch	1	287.0	0.0	0.0	\$0.00			
23	USR Church	0	lallway between front and back	N/A	N/A	LED Exit Sign		0	0	5	1	None	0	40.3	0.0	0.0	\$0.00			
24	USR Church	0	Kitchen & children meal area	N/A	N/A	LED_Lamp	LED 18W Replacement	2	Electronic	36	8	Switch	1	635.9	512.3	0.2	\$101.09	\$304.00	\$96.00	4.0
25	USR Church	0	Kitchen & children meal area	N/A	N/A	LED Exit Sign		0	0	5	2	None	0	80.6	0.0	0.0	\$0.00			
26	USR Church	0	Front nursery play area	N/A	N/A	LED_Lamp	LED 18W Replacement	2	Electronic	36	11	Switch	1	570.2	459.4	0.3	\$90.65	\$418.00	\$132.00	6.1
27	USR Church	0	Front nursery play area	N/A	N/A	LED Exit Sign		0	0	5	1	None	0	40.3	0.0	0.0	\$0.00			
28	USR Church	0	Front nursery play area	N/A	N/A	T8_Fluorescent	32W	1	Electronic	33.2	1	Switch	1	47.8	0.0	0.0	\$0.00			
29	USR Church	0	ce/Kitchen/Hallway near nursery	N/A	N/A	Circline_Lamp	32W_T9	1	Magnetic	40	3	Switch	1	80.6	0.0	0.0	\$0.00			
30	USR Church	0	ce/Kitchen/Hallway near nursery	N/A	N/A	LED Exit Sign		0	0	5	2	None	0	80.6	0.0	0.0	\$0.00			
31	USR Church	0	ce/Kitchen/Hallway near nursery	N/A	N/A	T8_Fluorescent	32W	1	Electronic	33.2	1	Switch	1	14.3	0.0	0.0	\$0.00			
32	USR Church	0	Mens bathroom	N/A	N/A	T8_Fluorescent	32W	4	Electronic	106.7	1	Switch	1	35.9	0.0	0.0	\$0.00			
33	USR Church	0	Mens bathroom	N/A	N/A	T8_Fluorescent	32W	2	Electronic	62	1	Switch	1	20.8	0.0	0.0	\$0.00			
34	USR Church	0	Womens bathroom	N/A	N/A	T8_Fluorescent	32W	4	Electronic	106.7	1	Switch	1	35.9	0.0	0.0	\$0.00			
35	USR Church	0	Womens bathroom	N/A	N/A	T8_Fluorescent	32W	2	Electronic	62	1	Switch	1	20.8	0.0	0.0	\$0.00			
36	USR Church	0	Boys bathroom	N/A	N/A	T8_U_Shaped_Fluorescent	32W	2	Electronic	65	1	Switch	1	143.5	0.0	0.0	\$0.00			
37	USR Church	0	Girls bathroom	N/A	N/A	T8_U_Shaped_Fluorescent	32W	2	Electronic	65	1	Switch	1	143.5	0.0	0.0	\$0.00			
38	USR Church	0	Hallway outside bathroom	N/A	N/A	CFL_Screw_In	15W	2	n/a	30	2	Switch	1	132.5	0.0	0.0	\$0.00			
39	USR Church	0	Hallway outside bathroom	N/A	N/A	LED Exit Sign		0	n/a	5	1	None	0	40.3	0.0	0.0	\$0.00			
40	USR Church	1	External building walls	N/A	N/A	CFL_Screw_In	13W	1	n/a	13	15	Autom. Timer	1	245.7	0.0	0.0	\$0.00			
41	USR Church	1	ighting for stainglass South & North side	N/A	N/A	LED_Lamp	LED 18W Replacement	1	n/a	18	3	Autom. Timer	1	68.0	310.0	0.2	\$61.17	\$59.91	\$18.00	1.3
42	USR Church	1	al lighting for stainglass South side	N/A	N/A	LED_Lamp	LED 13.5W Replacement	1	n/a	13.5	2	Autom. Timer	1	34.0	155.0	0.1	\$30.58	\$31.94	\$12.00	1.4
43	USR Church	1	ternal path lights on North Side	N/A	N/A	LED_Lamp	LED 13.5W Replacement	1	Magnetic	13.5	3	Autom. Timer	1	51.0	293.0	0.2	\$57.81	\$42.00	\$18.00	1.0
44	USR Church	1	ternal path lights on North Side	N/A	N/A	CFL_Screw_In	60W	1	n/a	60	1	Autom. Timer	1	75.6	0.0	0.0	\$0.00			
45	USR Church	1	Entrance vestibule	N/A	N/A	LED_Lamp	RAB_12W_Retrofit_90WPAR	1	n/a	12	1	Switch	1	1.2	0.0	0.0	\$0.00			
46	USR Church	1	Entrance vestibule	N/A	N/A	Halogen	90W	1	Electronic	95	5	Switch	1	45.6	0.0	0.0	\$0.00			
47	USR Church	1	Entrance vestibule	N/A	N/A	LED Exit Sign	5W	1	n/a	5	1	None	0	40.3	0.0	0.0	\$0.00			
48	USR Church	1	Aditorium Storage Closet	N/A	N/A	T8_Fluorescent	32W	4	Electronic	106.7	1	Switch	1	1.3	0.0	0.0	\$0.00			
49	USR Church	1	Aditorium Storage Closet	N/A	N/A	Incandescent	60W	1	n/a	60	1	Switch	1	0.7	0.0	0.0	\$0.00			
50	USR Church	1	Bathroom	N/A	N/A	T8_Fluorescent	32W	2	Electronic	62	1	Switch	1	20.8	0.0	0.0	\$0.00			
51	USR Church	2	Stainwell Closet	N/A	N/A	T8_Fluorescent	32W	3	Electronic	86.2	1	Switch	1	1.0	0.0	0.0	\$0.00			
52	USR Church	2	HVAC AHU Rm 1	N/A	N/A	T8_Fluorescent	32W	1	Electronic	33.2	3	Switch	1	1.2	0.0	0.0	\$0.00			
53	USR Church	0	Electical Closet	N/A	N/A	T8_Fluorescent	32W	1	Electronic	33.2	2	Switch	1	0.8	0.0	0.0	\$0.00			
54	USR Church	1	side - Car Park (street light style)	N/A	N/A	High_Pressure_Sodium	250W	1	n/a	295	1	Autom. Timer	1	371.7	0.0	0.0	\$0.00			

APPENDIX C: UPCOMING EQUIPMENT PHASEOUTS

LIGHTING:

- As of **July 1, 2010** magnetic ballasts most commonly used for the operation of T12 lamps are no longer being produced for commercial and industrial applications.
- As of **January 1, 2012** 100 watt incandescent bulbs have been phased out in accordance with the Energy Independence and Security Act of 2007.
- As of **July 2012** many non energy saver model T12 lamps have been phased out of production.
- As of **January 1, 2013** 75 watt incandescent bulbs have been phased out in accordance with the Energy Independence and Security Act of 2007.
- As of **January 1, 2014** 60 and 40 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.
- Energy Independence and Security Act of 2007 incandescent lamp phase-out exclusions:
 1. Appliance lamp (e.g. refrigerator or oven light)
 2. Black light lamp
 3. Bug lamp
 4. Colored lamp
 5. Infrared lamp
 6. Left-hand thread lamp
 7. Marine lamp
 8. Marine signal service lamp
 9. Mine service lamp
 10. Plant light lamp
 11. Reflector lamp
 12. Rough service lamp
 13. Shatter-resistant lamp (including a shatter-proof lamp and a shatter-protected lamp)
 14. Sign service lamp
 15. Silver bowl lamp
 16. Showcase lamp
 17. 3-way incandescent lamp
 18. Traffic signal lamp
 19. Vibration service lamp
 20. Globe shaped "G" lamp (as defined in ANSI C78.20-2003 and C79.1-2002 with a diameter of 5 inches or more)
 21. T shape lamp (as defined in ANSI C78.20-2003 and C79.1-2002) and that uses not more than 40 watts or has a length of more than 10 inches
 22. A B, BA, CA, F, G16-1/2, G-25, G30, S, or M-14 lamp (as defined in ANSI C79.1-2002 and ANSI C78.20-2003) of 40 watts or less
 23. Candelabra incandescent and other lights not having a medium Edison screw base.
- When installing compact fluorescent lamps (CFLs), be advised that they contain a very small amount of mercury sealed within the glass tubing and EPA guidelines concerning

cleanup and safe disposal of compact fluorescent light bulbs should be followed. Additionally, all lamps to be disposed should be recycled in accordance with EPA guidelines through state or local government collection or exchange programs instead.

HCFC (Hydro chlorofluorocarbons):

- As of **January 1, 2010**, no production and no importing of R-142b and R-22, except for use in equipment manufactured before January 1, 2010, in accordance with adherence to the Montreal Protocol.
- As of **January 1, 2015**, No production and no importing of any HCFCs, except for use as refrigerants in equipment manufactured before January 1, 2010.
- As of **January 1, 2020** No production and no importing of R-142b and R-22.

APPENDIX D: THIRD PARTY ENERGY SUPPLIERS

<http://www.state.nj.us/bpu/commercial/shopping.html>

PSE&G ELECTRIC SERVICE TERRITORY
Last Updated: 12/11/14

***CUSTOMER CLASS - R – RESIDENTIAL C – COMMERCIAL I –INDUSTRIAL**

Supplier	Telephone & Web Site	*Customer Class
Abest Power & Gas of NJ, LLC 202 Smith Street Perth Amboy, NJ 08861	(888)987-6937 www.AbestPower.com	R/C/I ACTIVE
AEP Energy, Inc. f/k/a BlueStar Energy Services 309 Fellowship Road, Fl. 2 Mount Laurel, NJ 08054	(866) 258-3782 www.aepenergy.com	R/C/I ACTIVE
Alpha Gas and Electric, LLC 641 5 th Street Lakewood, NJ 08701	(855) 553-6374 www.alphagasandelectric.com	R/C ACTIVE
Ambit Northeast, LLC d/b/a Ambit Energy 103 Carnegie Center Suite 300 Princeton, NJ 08540	877-282-6284 www.ambitenergy.com	R/C ACTIVE
American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 www.americanpowernet.com	C/I ACTIVE
Amerigreen Energy, Inc. 333Sylvan Avenue Englewood Cliffs, NJ 07632	888-559-4567 www.amerigreen.com	R/C ACTIVE
AP Gas & Electric, (NJ) LLC 10 North Park Place, Suite 420 Morristown, NJ 07960	(855) 544-4895 www.apgelle.com	R/C/I ACTIVE
Astral Energy LLC 16 Tyson Place Bergenfield, NJ 07621	(888)850-1872 www.AstralEnergyLLC.com	R/C/I ACTIVE
Barclays Capital Services, Inc. 70 Hudson Street Jersey City, NJ 07302-4585	(800) 526-7000 www.barclays.com	C ACTIVE
BBPC, LLC d/b/a Great Eastern Energy	(888) 651-4121	C

116 Village Blvd. Suite 200 Princeton, NJ 08540	www.greateasternenergy.com	ACTIVE
Berkshire Energy Partners, LLC 9 Berkshire Road Landenberg, PA 19350 Attn: Dana A. LeSage, P.E.	(610) 255-5070 www.berkshireenergypartners.com	C/I ACTIVE
Blue Pilot Energy, LLC 197 State Rte. 18 South Ste. 3000 East Brunswick, NJ 08816	(800) 451-6356 www.bluepilotenergy.com	R/C ACTIVE
Brick Standard, LLC 235 Hudson Street Suite 1 Hoboken, NJ 07030	(201)706-8101 www.standardalternative.com	C/I ACTIVE
CCES LLC dba Clean Currents Energy Services 566 Terhune Street Teaneck, NJ 07666	(877) 933-2453 www.cleancurrents.com	R/C ACTIVE
Champion Energy Services, LLC 1200 Route 22 Bridgewater, NJ 08807	(888) 653-0093 www.championenergyservices.com	R/C/I ACTIVE
Choice Energy, LLC 4257 US Highway 9, Suite 6C Freehold, NJ 07728	(888) 565-4490 www.4choiceenergy.com	R/C ACTIVE
Clearview Electric, Inc. 1744 Lexington Avenue Pennsauken, NJ 08110	(888) CLR-VIEW (800) 746- 4702 www.clearviewenergy.com	R/C/I ACTIVE
Commerce Energy, Inc. 7 Cedar Terrace Ramsey, NJ 07446	1-866-587-8674 www.commerceenergy.com	R/C ACTIVE
Community Energy Inc. 51 Sandbrook Headquarters Road Stockton, NJ 08559	(866)946-3123 www.communityenergyinc.com	R/C/I ACTIVE
ConEdison Solutions Cherry Tree Corporate Center 535 State Highway Suite 180 Cherry Hill, NJ 08002	(888) 665-0955 www.conedsolutions.com	C/I ACTIVE

ConocoPhillips Company 224 Strawbridge Drive Suite 107 Moorestown, NJ 08057	(800) 646-4427 www.conocophillips.com	C/I ACTIVE
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 www.constellation.com	R/C/I ACTIVE
Constellation Energy 900A Lake Street, Suite 2 Ramsey, NJ 07446	(877) 997-9995 www.constellation.com	R ACTIVE
Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450	(212) 538-3124 www.creditsuisse.com	C ACTIVE
Direct Energy Business, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(888) 925-9115 http://www.business.directenergy.com/	R ACTIVE
Direct Energy Business Marketing, LLC (fka Hess Energy Marketing) 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 http://www.business.directenergy.com/	C/I ACTIVE
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(888) 925-9115 www.directenergy.com	R ACTIVE
Direct Energy Small Business, LLC (fka Hess Small Business Services, LLC) One Hess Plaza Woodbridge, NJ 07095	(888) 464-4377 http://www.business.directenergy.com/	C/I ACTIVE
Discount Energy Group, LLC 811 Church Road, Suite 149 Cherry Hill, New Jersey 08002	(800) 282-3331 www.discountenergygroup.com	R/C ACTIVE
DTE Energy Supply, Inc. One Gateway Center, Suite 2600 Newark, NJ 07102	(877) 332-2450 www.dtesupply.com	C/I ACTIVE

Energy.me Midwest LLC 90 Washington Blvd Bedminster, NJ 07921	(855) 243-7270 www.energy.me	R/C/I ACTIVE
Energy Plus Holdings LLC 309 Fellowship Road East Gate Center, Suite 200 Mt. Laurel, NJ 08054	(877) 866-9193 www.energypluscompany.com	R/C ACTIVE
Ethical Electric Benefit Co. d/b/a Ethical Electric 100 Overlook Center, 2 nd Fl. Princeton, NJ 08540	(888) 444-9452 www.ethicalelectric.com	R/C ACTIVE
Energy Service Providers, Inc., d/b/a New Jersey Gas & Electric 1 Bridge Plaza fl. 2 Fort Lee, NJ 07024	(866) 568-0290 www.njgande.com	R/C ACTIVE
FirstEnergy Solutions 150 West State Street Trenton, NJ 08608	(866) 625-7318 www.fes.com	C/I ACTIVE
Gateway Energy Services Corp. 120 Wood Avenue Suite 611 Iselin, NJ 08830	(866)348-4193 www.directenergybusiness.com	R/C ACTIVE
GDF SUEZ Energy Resources NA, Inc. 333 Thornall Street Sixth Floor Edison, NJ 08837	(866) 999-8374 www.gdfsuezenergyresources.com	C/I ACTIVE
GDF Suez Retail Energy Solutions LLC d/b/a THINK ENERGY 333 Thornall St. Sixth Floor Edison, NJ 08819	1-866-252-0078 www.mythinkenergy.com	R/C/I ACTIVE
Glacial Energy of New Jersey, Inc. 21 Pine Street, Suite 237 Rockaway, NJ 07866	(888) 452-2425 www.glacialenergy.com	C/I ACTIVE
Global Energy Marketing LLC 129 Wentz Avenue Springfield, NJ 07081	(800) 542-0778 www.globalp.com	R/C/I ACTIVE

Green Mountain Energy Company 211 Carnegie Center Drive Princeton, NJ 08540	(866) 767-5818 www.greenmountain.com/commercial-home	C/I ACTIVE
Harborside Energy LLC 101 Hudson Street Suite 2100 Jersey City, NJ 07302	(877) 940-3835 www.harborsideenergynj.com	R/C ACTIVE
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com	C/I ACTIVE
HIKO Energy, LLC 655 Suffern Road Teaneck, NJ 07666	(888) 264-4908 www.hikoenergy.com	R/C/I ACTIVE
Hudson Energy Services, LLC 7 Cedar Street Ramsey, New Jersey 07446	(877) Hudson 9 www.hudsonenergyservices.com	C ACTIVE
IDT Energy, Inc. 550 Broad Street Newark, NJ 07102	(877) 887-6866 www.idtenergy.com	R/C ACTIVE
Independence Energy Group, LLC 211 Carnegie Center Princeton, NJ 08540	(877) 235-6708 www.chooseindependence.com	R/C ACTIVE
Inspire Energy Holdings LLC 923 Haddonfield Road 3rd Fl. Building B2 Cherry Hill, NJ 08002	(866) 403-2620 www.inspireenergy.com	R/C/I
Integrus Energy Services, Inc. 33 Wood Ave, South, Suite 610 Iselin, NJ 08830	(800) 536-0151 www.integrusenergy.com	C/I ACTIVE
Jsynergy, LLC 445 Central Ave. Suite 204 Cedarhurst, NY 11516	(516) 331-2020 Jsynergylc.com	R/C/I ACTIVE
Kuehne Chemical Company, Inc. 86 North Hackensack Avenue South Kearney, NJ 07032	(973) 589-0700 kuehnechemical@comcast.net	I

Liberty Power Delaware, LLC 1973 Highway 34, Suite 211 Wall, NJ 07719	(866) 769-3799 www.libertypowercorp.com	C/I ACTIVE
Liberty Power Holdings, LLC 1973 Highway 34, Suite 211 Wall, NJ 07719	(866) 769-3799 www.libertypowercorp.com	R/C/I ACTIVE
Linde Energy Services 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.linde.com	C/I ACTIVE
Marathon Power LLC 302 Main Street Paterson, NJ 07505	(888) 779-7255 www.mecny.com	R/C/I ACTIVE
MP2 Energy NJ, LLC 111 River Street, Suite 1204 Hoboken, NJ 07030	(877) 238-5343 www.mp2energy.com	R/C/I ACTIVE
Natures Current, LLC 95 Fairmount Avenue Philadelphia, Pennsylvania 19123	(215) 464-6000 www.naturescurrent.com	R/C/I ACTIVE
MPower Energy NJ LLC One University Plaza, Suite 507 Hackensack, NJ 07601	(877) 286-7693 www.mpowerenergy.com	R/C/I ACTIVE
NATGASCO, Inc. (Supreme Energy, Inc.) 532 Freeman St. Orange, NJ 07050	(800) 840-4427 www.supremeenergyinc.com	R/C/I ACTIVE
New Jersey Gas & Electric 10 North Park Place Suite 420 Morristown, NJ 07960	(866) 568-0290 www.njgande.com	R/C/ ACTIVE
NextEra Energy Services New Jersey, LLC 651 Jernee Mill Road Sayreville, NJ 08872	(877) 528-2890 Commercial (800) 882-1276 Residential www.nexteraenergyservices.com	R/C/I ACTIVE
Noble Americas Energy Solutions The Mac-Cali Building 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.noblesolutions.com	C/I ACTIVE

Nordic Energy Services, LLC 50 Tice Boulevard, Suite 340 Woodcliff Lake, NJ 07677	(877) 808-1027 www.nordiceenergy.us.com	R/C/I ACTIVE
North American Power and Gas, LLC 222 Ridgedale Avenue Cedar Knolls, NJ 07927	(888) 313-9086 www.napower.com	R/C/I ACTIVE
North Eastern States, Inc. d/b/a Entrust Energy 90 Washington Valley Road Bedminster, NJ 07921	(888) 535-6340 www.entrustenergy.com	R/C/I ACTIVE
Oasis Power, LLC d/b/a Oasis Energy 11152 Westheimer, Suite 901 Houston, TX 77042	(800)324-3046 www.oasisenergy.com	R/C ACTIVE
Palmco Power NJ, LLC One Greentree Centre 10,000 Lincoln Drive East, Suite 201 Marlton, NJ 08053	(877) 726-5862 www.PalmcoEnergy.com	R/C/I ACTIVE
Park Power, LLC 1200 South Church St. Suite 23 Mount Laurel, NJ 08054	(856) 778-0079 www.parkpower.com	R/C/I ACTIVE
Plymouth Rock Energy, LLC 338 Maitland Avenue Teaneck, NJ 07666	(855) 32-POWER (76937) www.plymouthenergy.com	R/C/I ACTIVE
Power Management Co., LLC b/b/a PMC Lightsavers Limited Liability Company 1600 Moseley Road Victor, NY 14564	(585) 249-1360 www.powermanagementco.com	C/I ACTIVE
PPL Energy Plus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com	C/I ACTIVE
PPL EnergyPlus Retail, LLC 788 Shrewsbury Avenue, Suite 220 Tinton Falls, NJ 07724	(732) 741-0505 – 2000 www.pplenergyplus.com	C/I ACTIVE
Progressive Energy Consulting, LLC	(917) 837-7400	R/C/I

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Prospect Resources, Inc. 208 W. State Street Trenton, NJ 08608-1002	(847) 673-1959 www.prospectresources.com	C ACTIVE
Public Power & Utility of New Jersey, LLC One International Blvd, Suite 400 Mahwah, NJ 07495	(888) 354-4415 www.ppandu.com	R/C/I ACTIVE
Reliant Energy 211 Carnegie Center Princeton, NJ 08540	(877) 297-3795 (877) 297-3780 www.reliant.com	R/C/I ACTIVE
ResCom Energy LLC 18C Wave Crest Ave. Winfield Park, NJ 07036	(888) 238-4041 http://rescomenergy.com	R/C/I ACTIVE
Residents Energy, LLC 550 Broad Street Newark, NJ 07102	(888) 828-7374 www.residentsenergy.com	R/C
Respond Power LLC 1001 East Lawn Drive Teaneck, NJ 07666	(877) 973-7763 www.majorenergy.com	R/C/I ACTIVE
Save on Energy, LLC 1101 Red Ventures Drive Fort Mill, SC 29707	1 (877)-658-3183 www.saveonenergy.com	R/C
SFE Energy One Gateway Center Suite 2600 Newark, NJ 07012	1 (877) 316-6344 www.sfeenergy.com	R/C/I ACTIVE
S.J. Energy Partners, Inc. 208 White Horse Pike, Suite 4 Barrington, NJ 08007	(800) 695-0666 www.sjnaturalgas.com	C ACTIVE
SmartEnergy Holdings, LLC 100 Overlook Center 2nd Floor Princeton, NJ NJ 08540 United States of America	(800) 443-4440 www.smartenergy.com	R/C/I ACTIVE
South Jersey Energy Company 1 South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 266-6020 www.southjerseyenergy.com	R/C/I ACTIVE

Spark Energy Gas, LP/ Spark Energy 2105 City West Blvd. Suite 100 Houston, TX 77042	(713)600-2600 www.sparkenergy.com	R/C/I ACTIVE
Sperian Energy Corp. 1200 Route 22 East, Suite 2000 Bridgewater, NJ 08807	(888) 682-8082 www.sperianenergy.com	R/C/I ACTIVE
Starion Energy PA Inc. 101 Warburton Avenue Hawthorne, NJ 07506	(800) 600-3040 www.starionenergy.com	R/C/I ACTIVE
Stream Energy New Jersey, LLC 309 Fellowship Rd., Suite 200 Mt. Laurel, NJ 08054	(877) 369-8150 www.streamenergy.net	R/C ACTIVE
Summit Energy Services, Inc. 10350 Ormsby Park Place Suite 400 Louisville, KY 40223	1 (800) 90-SUMMIT www.summitenergy.com	C/I ACTIVE
Texas Retail Energy LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663 Attn: Chris Hendrix	(866) 532-0761 Texasretailenergy.com	C/I ACTIVE
TransCanada Power Marketing Ltd. 190 Middlesex Essex Turnpike, Suite 200 Iselin, NJ 08830	(877) MEGAWAT www.transcanada.com/powermarketing	C/I ACTIVE
TriEagle Energy, LP 90 Washington Valley Rd Bedminster, NJ 07921	(877) 933-2453 www.trieagleenergy.com	R/C/I ACTIVE
UGI Energy Services, Inc. dba UGI Energy Link 224 Strawbridge Drive Suite 107 Moorestown, NJ 08057	(800) 427-8545 www.ugienergylink.com	C/I ACTIVE
Verde Energy USA, Inc. 2001 Route 46 Waterview Plaza Suite 301 Parsippany, NJ 07054	(800) 388-3862 www.lowcostpower.com	R/C ACTIVE

Viridian Energy 2001 Route 46, Waterview Plaza Suite 310 Parsippany, NJ 07054	(866) 663-2508 www.viridian.com	R/C/I ACTIVE
XOOM Energy New Jersey, LLC 744 Broad Street. 16 th Floor Newark, NJ 07102	(888) 997-8979 www.xoomenergy.com	R/C/I ACTIVE
YEP Energy 89 Headquarters Plaza North #1463 Morristown, NJ 07960	(855) 363-7736 www.yepenergyNJ.com	R/C/I ACTIVE
Your Energy Holdings, LLC One International Boulevard Suite 400 Mahwah, NJ 07495-0400	(855) 732-2493 www.thisisyourenergy.com	R/C/I ACTIVE

[Back to the main supplier page](#)

APPENDIX E: GLOSSARY AND METHOD OF CALCULATIONS

Net ECM Cost: The net ECM cost is the cost experienced by the customer, which is typically the total cost (materials + labor) of installing the measure minus any available incentives. Both the total cost and the incentive amounts are expressed in the summary for each ECM.

Annual Energy Cost Savings (AECS): This value is determined by the audit firm based on the calculated energy savings (kWh or Therm) of each ECM and the calculated energy costs of the building.

Lifetime Energy Cost Savings (LECS): This measure estimates the energy cost savings over the lifetime of the ECM. It can be a simple estimation based on fixed energy costs. If desired, this value can factor in an annual increase in energy costs as long as the source is provided.

Simple Payback: This is a simple measure that displays how long the ECM will take to break-even based on the annual energy and maintenance savings of the measure.

ECM Lifetime: This is included with each ECM so that the owner can see how long the ECM will be in place and whether or not it will exceed the simple payback period. Additional guidance for calculating ECM lifetimes can be found below. This value can come from manufacturer's rated lifetime or warranty, the ASHRAE rated lifetime, or any other valid source.

Operating Cost Savings (OCS): This calculation is an annual operating savings for the ECM. It is the difference in the operating, maintenance, and / or equipment replacement costs of the existing case versus the ECM. In the case where an ECM lifetime will be longer than the existing measures (such as LED lighting versus fluorescent) the operating savings will factor in the cost of replacing the units to match the lifetime of the ECM. In this case or in one where one-time repairs are made, the total replacement / repair sum is averaged over the lifetime of the ECM.

Return on Investment (ROI): The ROI is expressed as the percentage return of the investment based on the lifetime cost savings of the ECM. This value can be included as an annual or lifetime value, or both.

Net Present Value (NPV): The NPV calculates the present value of an investment's future cash flows based on the time value of money, which is accounted for by a discount rate (assumes bond rate of 3.0%).

Internal Rate of Return (IRR): The IRR expresses an annual rate that results in a break-even point for the investment. If the owner is currently experiencing a lower return on their capital than the IRR, the project is financially advantageous. This measure also allows the owner to compare ECMs against each other to determine the most appealing choices.

Gas Rate and Electric Rate (\$/therm and \$/kWh): The gas rate and electric rate used in the financial analysis is the total annual energy cost divided by the total annual energy usage for the 12 month billing period studied. The graphs of the monthly gas and electric rates reflect the total monthly energy costs divided by the monthly usage, and display how the average rate fluctuates throughout the year. The average annual rate is the only rate used in energy savings calculations.

Calculation References

Term	Definition
ECM	Energy Conservation Measure
AOCS	Annual Operating Cost Savings
AECS	Annual Energy Cost Savings
LOCS*	Lifetime Operating Cost Savings
LECS	Lifetime Energy Cost Savings
LCS	Lifetime Cost Savings
NPV	Net Present Value
IRR	Internal Rate of Return
DR	Discount Rate
Net ECM Cost	Total ECM Cost – Incentive
LECS	AECS X ECM Lifetime
AOCS	LOCS / ECM Lifetime
LCS	LOCS+LECS
Simple Payback	Net ECM Cost / (AECS + AOCS)
Lifetime ROI	(LECS + LOCS – Net ECM Cost) / Net ECM Cost
Annual ROI	(Lifetime ROI / Lifetime) = [(AECS + OCS) / Net ECM Cost – (1 / Lifetime)]

* The lifetime operating cost savings are all avoided operating, maintenance, and/or component replacement costs over the lifetime of the ECM. This can be the sum of any annual operating savings, recurring or bulk (i.e. one-time repairs) maintenance savings, or the savings that comes from avoiding equipment replacement needed for the existing measure to meet the lifetime of the ECM (e.g. lighting change outs).

Excel NPV and IRR Calculation

In Excel, function =IRR (values) and =NPV (rate, values) are used to quickly calculate the IRR and NPV of a series of annual cash flows. The investment cost will typically be a negative cash flow at year 0 (total cost - incentive) with years 1 through the lifetime receiving a positive cash flow from the annual energy cost savings and annual maintenance savings. The calculations in the example below are for an ECM that saves \$850 annually in energy and maintenance costs (over a 10 year lifetime) and takes \$5,000 to purchase and install after incentives:

	A	B	C	D	E	F	G	H	I
1									
2									
3									
4					Year	Cash Flow			
5					0	\$ (5,000.00)	<div style="border: 1px solid black; padding: 5px; width: fit-content;">Investment Cost</div> <div style="border: 1px solid black; padding: 5px; width: fit-content;">Cash Flow: Annual Energy Cost Savings + Annual Maintenance Savings</div> <div style="border: 1px solid black; padding: 5px; width: fit-content;">Formula: =IRR(F4:F14) =NPV(0.03,F5:F14)+F4</div>		
6					1	\$ 850.00			
7					2	\$ 850.00			
8					3	\$ 850.00			
9					4	\$ 850.00			
10					5	\$ 850.00			
11					6	\$ 850.00			
12					7	\$ 850.00			
13					8	\$ 850.00			
14					9	\$ 850.00			
15					10	\$ 850.00			
16					IRR	11.03%			
17					NPV	\$2,250.67			

Solar PV ECM Calculation

There are several components to the calculation:

Costs:	Material of PV system including panels, mounting and net-metering + Labor
Energy Savings:	Reduction of kWh electric cost for life of panel, 25 years Solar Renewable Energy Credits (SRECs) – Market-rate incentive. Calculations assume \$180/Megawatt hour consumed per year for a maximum of 15 years; added to annual energy cost savings for a period of 15 years. (Megawatt hour used is rounded to nearest 1,000 kWh)
Assumptions:	A Solar Pathfinder device is used to analyze site shading for the building and determine maximum amount of full load operation based on available sunlight. When the Solar Pathfinder device is not implemented, amount of full load operation based on available sunlight is assumed to be 1,180 hours in New Jersey.

Total lifetime PV energy cost savings =
kWh produced by panel * [\$/kWh cost * 25 years + \$180/Megawatt hour /1000 * 15 years]

ECM and Equipment Lifetimes

Determining a lifetime for equipment and ECM's can sometimes be difficult. The following table contains a list of lifetimes that the NJCEP uses in its commercial and industrial programs. Other valid sources are also used to determine lifetimes, such as the DOE, ASHRAE, or the manufacturer's warranty.

Lighting is typically the most difficult lifetime to calculate because the fixture, ballast, and bulb can all have different lifetimes. Essentially the ECM analysis will have different operating cost savings (avoided equipment replacement) depending on which lifetime is used.


When the bulb lifetime is used (rated burn hours / annual burn hours), the operating cost savings is just reflecting the theoretical cost of replacing the existing case bulb and ballast over the life of the recommended bulb. Dividing by the bulb lifetime will give an annual operating cost savings.

When a fixture lifetime is used (e.g. 15 years) the operating cost savings reflects the avoided bulb and ballast replacement cost of the existing case over 15 years minus the projected bulb and ballast replacement cost of the proposed case over 15 years. This will give the difference of the equipment replacement costs between the proposed and existing cases and when divided by 15 years will give the annual operating cost savings.

New Jersey Clean Energy Program Commercial Equipment Life Span

Measure	Life Span
Commercial Lighting — New	15
Commercial Lighting — Remodel/Replacement	15
Commercial Custom — New	18
Commercial Chiller Optimization	18
Commercial Unitary HVAC — New - Tier 1	15
Commercial Unitary HVAC — Replacement - Tier 1	15
Commercial Unitary HVAC — New - Tier 2	15
Commercial Unitary HVAC — Replacement Tier 2	15
Commercial Chillers — New	25
Commercial Chillers — Replacement	25
Commercial Small Motors (1-10 HP) — New or Replacement	20
Commercial Medium Motors (11-75 HP) — New or Replacement	20
Commercial Large Motors (76-200 HP) — New or Replacement	20
Commercial VSDs — New	15
Commercial VSDs — Retrofit	15
Commercial Comprehensive New Construction Design	18
Commercial Custom — Replacement	18
Industrial Lighting — New	15
Industrial Lighting — Remodel/Replacement	15
Industrial Unitary HVAC — New - Tier 1	15
Industrial Unitary HVAC — Replacement - Tier 1	15
Industrial Unitary HVAC — New - Tier 2	15
Industrial Unitary HVAC — Replacement Tier 2	15
Industrial Chillers — New	25
Industrial Chillers — Replacement	25
Industrial Small Motors (1-10 HP) — New or Replacement	20
Industrial Medium Motors (11-75 HP) — New or Replacement	20
Industrial Large Motors (76-200 HP) — New or Replacement	20
Industrial VSDs — New	15
Industrial VSDs — Retrofit	15
Industrial Custom — Non-Process	18
Industrial Custom — Process	10
Small Commercial Gas Furnace — New or Replacement	20
Small Commercial Gas Boiler — New or Replacement	20
Small Commercial Gas DHW — New or Replacement	10
C&I Gas Absorption Chiller — New or Replacement	25
C&I Gas Custom — New or Replacement (Engine Driven Chiller)	25
C&I Gas Custom — New or Replacement (Gas Efficiency Measures)	18
O&M savings	3
Compressed Air (GWh participant)	8

APPENDIX F: STATEMENT OF ENERGY PERFORMANCE FROM ENERGY STAR®



ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

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ENERGY STAR®
Score¹

Anderson Hall

Primary Property Function: Worship Facility
Gross Floor Area (ft²): 8,252
Built: 1968

For Year Ending: October 31, 2014
Date Generated: March 24, 2015

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information		
Property Address	Property Owner	Primary Contact
Anderson Hall 113 Cottage Place Ridgewood, New Jersey 07450	_____ () - _____	_____ () - _____
Property ID: 4385481		

Energy Consumption and Energy Use Intensity (EUI)				
Site EUI 78.9 kBtu/ft ²	Annual Energy by Fuel		National Median Comparison	
	Natural Gas (kBtu)	451,831 (89%)	National Median Site EUI (kBtu/ft ²)	71.8
	Electric - Grid (kBtu)	199,111 (31%)	National Median Source EUI (kBtu/ft ²)	121.3
		% Diff from National Median Source EUI	10%	
Source EUI 133.2 kBtu/ft ²	Annual Emissions			
	Greenhouse Gas Emissions (Metric Tons CO ₂ e/year)		51	

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____ Date: _____

Licensed Professional

() - _____



Professional Engineer Stamp
(if applicable)

APPENDIX G: INCENTIVE PROGRAMS

New Jersey Clean Energy Pay for Performance

The NJ Clean Energy Pay for Performance (P4P) Program relies on a network of Partners who provide technical services to clients. LGEA participating clients who are not receiving Direct Energy Efficiency and Conservation Block Grants are eligible for P4P. SWA is an eligible Partner and can develop an Energy Reduction Plan for each project with a whole-building traditional energy audit, a financial plan for funding the energy measures and an installation construction schedule.

The Energy Reduction Plan must define a comprehensive package of measures capable of reducing a building's energy consumption by 15+%. P4P incentives are awarded upon the satisfactory completion of three program milestones: submittal of an Energy Reduction Plan prepared by an approved Program Partner, installation of the recommended measures, and completion of a Post-Construction Benchmarking Report. The incentives for electricity and natural gas savings will be paid based on actual savings, provided that the minimum 15% performance threshold savings has been achieved.

For further information, please see: <http://www.njcleanenergy.com/commercial-industrial/programs/pay-performance/existing-buildings> .

Direct Install 2011 Program*

Direct Install is a division of the New Jersey Clean Energy Programs' Smart Start Buildings. It is a turn-key program for small to mid-sized facilities to aid in upgrading equipment to more efficient types. It is designed to cut overall energy costs by upgrading lighting, HVAC, and other equipment with energy efficient alternatives. The program pays **up to 70%** of the retrofit costs, including equipment cost and installation costs. Each project is limited to \$75,000 in incentives.

Eligibility:

- Existing small and mid-sized commercial and industrial facilities with peak electrical demand **below 200 kW** within 12 months of applying (the 200 kW peak demand threshold has been waived for local government entities who receive and utilize their Energy Efficiency and Conservation Block Grant in conjunction with Direct Install)
- Must be located in New Jersey
- Must be served by one of the state's public, regulated or natural gas companies

Energy Provider Incentives

- **South Jersey Gas** – Program offers financing up to \$25,000 on customer's 40% portion of the project and combines financing rate based on portion of the project devoted to gas and electric measures. All gas measures financed at 0%, all electric measures financed at normal rate. Does not offer financing on projects that only include electric measures.
- **Atlantic City Electric** – Provides a free audit, and additional incentives up to 20% of the current incentive up to a maximum of \$5,000 per customer.

For the most up to date information on contractors in New Jersey who participate in this program, go to: <http://www.njcleanenergy.com/commercial-industrial/programs/direct-install> or visit the utility web sites.

Smart Start

New Jersey's SmartStart Building Program is administered by New Jersey's Office of Clean Energy. The program also offers design support for larger projects and technical assistance for smaller projects. If your project specifications do not fit into anything defined by the program, there are even incentives available for custom projects.

There are a number of improvement options for commercial, industrial, institutional, government, and agricultural projects throughout New Jersey. Alternatives are designed to enhance quality while building in energy efficiency to save money. Project categories included in this program are New Construction and Additions, Renovations, Remodeling and Equipment Replacement.

Energy Provider Incentives

- **South Jersey Gas** – Program to finance projects up to \$25,000 not covered by incentive
- **New Jersey Natural Gas** – Will match SSB incentives on gas equipment
- **PSE&G** - Provides funding for site-specific uses of emerging technology. The incentives are determined on a case by case basis.

For the most up to date information on how to participate in this program, go to:

<http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings>.

Renewable Energy Incentive Program*

The Renewable Energy Incentive Program (REIP) provides incentives that reduce the upfront cost of installing renewable energy systems, including solar, wind, and sustainable biomass. Incentives vary depending upon technology, system size, and building type. Current incentive levels, participation information, and application forms can be found at the website listed below.

Solar Renewable Energy Credits (SRECs) represent all the clean energy benefits of electricity generated from a solar energy system. SRECs can be sold or traded separately from the power, providing owners a source of revenue to help offset the cost of installation. All solar project owners in New Jersey with electric distribution grid-connected systems are eligible to generate SRECs. Each time a system generates 1,000 kWh of electricity an SREC is earned and placed in the customer's account on the web-based SREC tracking system.

For the most up to date information on how to participate in this program, go to:

<http://www.njcleanenergy.com/renewable-energy/home/home>.

Utility Sponsored Programs

Check with your local utility companies for further opportunities that may be available.

Energy Efficiency and Conservation Block Grant Rebate Program

The Energy Efficiency and Conservation Block Grant (EECBG) Rebate Program provides supplemental funding up to \$20,000 for eligible New Jersey local government entities to lower the cost of installing energy conservation measures. Funding for the EECBG Rebate Program is provided through the American Recovery and Reinvestment Act (ARRA).

For the most up to date information on how to participate in this program, go to:
<http://njcleanenergy.com/EECBG>.

Other Federal and State Sponsored Programs

Other federal and state sponsored funding opportunities may be available, including BLOCK and R&D grant funding. For more information, please check <http://www.dsireusa.org/>.

*Subject to availability. Incentive program timelines might not be sufficient to meet the 25% in 12 months spending requirement outlined in the LGEA program.

APPENDIX H: ENERGY CONSERVATION MEASURES

ECM #	ECM Description	Est. Installed Cost (\$)	Est. Incentives (\$)	Net Est. ECM Cost with Incentives (\$)	1st Yr. Savings (kWh)	Demand Reduction/Mon (kW)	1st Yr. Savings (Therms)	1st Yr. Savings (kBtu/Sq Ft)	Total 1st Yr. Savings (\$)	Life of Measure (Yr)	Est. Lifetime Cost Savings (\$)	Simple Payback (Yr)	Lifetime Return on Investment (%)	Annual Return on Investment (%)	Internal Rate of Return (%)	Net Present Value (\$)	CO ₂ Reduced (lbs/Yr)
1	Install Insulation and Fill in Ventilation Structure in Anderson Hall	\$155	\$0	\$155	63	0.0	241	3.0	\$281	10	\$2,811	0.6	1717%	172%	182%	\$1,974	2,774
2	Install Low-Flow Aerators on All Building Faucets	\$45	\$0	\$45	0	0.0	29	0.3	\$32	10	\$321	1.4	613%	61%	71%	\$199	318
3	Install Insulation on Hot Water Supply and Return for AHU 2	\$927	\$0	\$927	0	0.0	474	5.7	\$528	10	\$5,279	1.8	469%	47%	56%	\$3,091	5,230
4	Install Weather-Stripping and Door Sweeps on the Front Doors	\$400	\$0	\$400	45	0.0	172	2.1	\$201	5	\$1,004	2.0	151%	30%	35%	\$336	1,981
5	Replace High Pressure Sodium, Incandescent and Fluorescent Lamps with LED	\$2,907	\$350	\$2,557	6,076	5.3	0	2.5	\$1,199	10	\$11,991	2.1	369%	37%	45%	\$6,581	10,880
Total		\$4,434	\$350	\$4,084	6,185	5.3	917	13.7	\$2,241		\$21,405	1.8	424%			\$12,181	21,183

Assumptions:

Discount Rate: 3.0%; Energy Price Escalation Rate: 0%

Note:

A 43.9 electrical demand reduction/month indicates that it is a significant amount.

APPENDIX I: METHOD OF ANALYSIS

Assumptions and Tools

Cost Estimates: RS Means Online Version 5.0.3
Published and established specialized equipment material and labor costs
Cost estimates also based on utility bill analysis and prior experience with similar projects

Disclaimer

This engineering audit was prepared using the most current and accurate fuel consumption data available for the site. The estimates that it projects are intended to help guide the owner toward best energy choices. The costs and savings are subject to fluctuations in weather, variations in quality of maintenance, changes in prices of fuel, materials, and labor, and other factors. Although we cannot guarantee savings or costs, we suggest that you use this report for economic analysis of the building and as a means to estimate future cash flow.

THE RECOMMENDATIONS PRESENTED IN THIS REPORT ARE BASED ON THE RESULTS OF ANALYSIS, INSPECTION, AND PERFORMANCE TESTING OF A SAMPLE OF COMPONENTS OF THE BUILDING SITE. ALTHOUGH CODE-RELATED ISSUES MAY BE NOTED, SWA STAFF HAVE NOT COMPLETED A COMPREHENSIVE EVALUATION FOR CODE-COMPLIANCE OR HEALTH AND SAFETY ISSUES. THE OWNER(S) AND MANAGER(S) OF THE BUILDING(S) CONTAINED IN THIS REPORT ARE REMINDED THAT ANY IMPROVEMENTS SUGGESTED IN THIS SCOPE OF WORK MUST BE PERFORMED IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS THAT APPLY TO SAID WORK. PARTICULAR ATTENTION MUST BE PAID TO ANY WORK WHICH INVOLVES HEATING AND AIR MOVEMENT SYSTEMS, AND ANY WORK WHICH WILL INVOLVE THE DISTURBANCE OF PRODUCTS CONTAINING MOLD, ASBESTOS, OR LEAD.