LOCAL GOVERNMENT ENERGY AUDIT PROGRAM: ENERGY AUDIT REPORT

PREPARED FOR:

UNITARIAN UNIVERSALIST CHURCH AT WASHINGTON CROSSING
268 WASHINGTON CROSSING-PENNINGTON ROAD
TITUSVILLE, NJ 08560
ATTN: LESLIE MCGEORGE & JOHN FOWLER,
UUCWC EARTH MINISTRY TEAM

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REPORT ISSUANCE: **FINAL, AUGUST 21, 2014**

PROJECT NO: **1C14086**

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I. EXECUTIVE SUMMARY

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

Unitarian Universalist Church at Washington Crossing
268 Washington Crossing-Pennington Road
Titusville, New Jersey 08560

Contact Persons: Leslie McGeorge and John Fowler

This audit is performed in connection with the New Jersey Clean Energy - Local Government Energy Audit Program for the Unitarian Universalist Church at Washington Crossing. The purpose of this analysis is to provide the church insight into the energy savings potential that exists within the facility. Energy Efficiency changes and upgrades requires support from the building occupants, operations personnel, and the administrators of the building in order to maximize the savings and overall benefit. The efficiency improvement of these buildings provides a benefit for the environment and the residents of New Jersey.

The Energy Conservation Measures (ECMs) identified within the report represent the potential annual savings at the facility. It is recommended to consider all ECMs as part of the Church's initiative to save energy, reduce emissions, and lower operating costs. The Church should review and be familiar with all measures presented in the report prior to making a decision on which projects to move forward with. This will enable the Church to effectively align report recommendations with those outlined in their mid/long range facility and financial plans. The Church should also review all conventional and unconventional funding, along with all NJCEP funding opportunities for these projects and determine which options fit their budget most positively in the short and long term. The combination of this information will enable the Church to put together a strategy that maximizes the received benefits of the selected projects.

The annual energy costs at this facility are as follows:

Electricity	$ 6,922
Natural Gas	$ 6,689
Total	$13,611

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

Table 1
Financial Summary Table

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
ECM #1	Lighting Upgrade - General	$15,620	$388	40.3	-62.7%
ECM #2	Lighting Upgrade - Exterior	$4,936	$141	35.0	-57.2%
ECM #3	De-stratification Fans	$6,900	$185	37.3	-59.8%
ECM #4	Domestic Hot Water Heater Upgrade	$6,260	$23	272.2	-94.5%
ECM #5	Weatherization	$200	$34	5.9	70.0%
ECM #6	Window Upgrades	$10,000	$277	36.1	-58.5%
ECM #7	Water Conservation	$210	$283	0.7	1247.6%
ECM #8	Air Balance Rooms 201,202,203 and Re-	$2,500	$22	113.6	-86.8%

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

The estimated demand and energy savings for each ECM is shown below in Table 2. The descriptions in this table correspond to the ECM's listed in Table 1.

Table 2
Energy Savings Summary Table

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
ECM #1	Lighting Upgrade - General	2.3	2,271	0
ECM #2	Lighting Upgrade - Exterior	0.8	826	0
ECM #3	De-stratification Fans	0.0	-151	191
ECM #4	Domestic Hot Water Heater Upgrade	0.0	0	21
ECM #5	Weatherization	0.0	56	22
ECM #6	Window Upgrades	0.0	356	197
ECM #7	Water Conservation	0.0	0	54
ECM #8	Air Balance Rooms 201,202,203 and Re-	0.0	128	0

Table 3
Emissions Summary Table

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	**DESCRIPTION**	**GREENHOUSE GAS EMISSIONS REDUCTION**		
		CO_2 EMISSIONS (LBS)	**NO_X EMISSIONS (LBS)**	**SO_2 EMISSIONS (LBS)**
ECM #1	Lighting Upgrade - General	3,452	6	15
ECM #2	Lighting Upgrade - Exterior	1,256	2	5
ECM #3	De-stratification Fans	2,005	1	(1)
ECM #4	Domestic Hot Water Heater Upgrade	246	0	0
ECM #5	Weatherization	343	0	0
ECM #6	Window Upgrades	2,846	3	2
ECM #7	Water Conservation	632	0	0
ECM #8	Air Balance Rooms 201,202,203 and Re-	195	0	1

Notes: A. Emissions Reduction based on NJCEP published factors for electric & gas.

Table 4
Combined Project Summary Table

FACILITY PROJECT SUMMARY TABLE					
ENERGY CONSERVATION MEASURES	**ANNUAL ENERGY SAVINGS ($)**	**PROJECT COST ($)**	**SMART START INCENTIVES**	**CUSTOMER COST**	**SIMPLE PAYBACK**
Lighting Upgrade - General	$388	$21,220	$5,600	$15,620	40.3
Lighting Upgrade - Exterior	$141	$5,236	$300	$4,936	35.0
De-stratification Fans	$185	$6,900	$0	$6,900	37.3
Domestic Hot Water Heater Upgrade	$23	$6,500	$240	$6,260	272.2
Weatherization	$34	$200	$0	$200	5.9
Window Upgrades	$277	$10,000	$0	$10,000	36.1
Water Conservation	$283	$210	$0	$210	0.7
Air Balance Rooms 201,202,203 and Re-	$22	$2,500	$0	$2,500	113.6
Total Project	**$1,353**	**$52,766**	**$6,140**	**$46,626**	**34.5**

This project does not qualify for additional incentives through the Pay for Performance Program; please see the Installation Funding Options section for additional program options.

Overall Assessment:

On the whole, Concord Engineering recommends the Church review and be familiar with all measures presented in each facility report prior to making a decision on which projects to move forward with. This will enable the Church to effectively align report recommendations with those outlined in their mid/long range facility plans and financial plans. The Church should also review all conventional and unconventional funding options, along with all NJCEP funding opportunities for these projects and determine which options fit their budget most positively in the short and long term. The combination of this information will enable the Church to put together an effective Energy Savings Improvement Strategy that maximizes the received benefits of the selected projects. The Installation and Funding Options Section further outlines what programs are potentially available to the owner for funding the project.

Other Considerations:

Renewable Energy Conservation Measures:

The Unitarian Universalist Church at Washington Crossing installed a 9.1 kW grid-tied solar array on the roof of the 1975 building. Investments in new solar panels for this facility are not recommended due to the existing solar panels utilizing all the viable areas for additional panels. The potential for wind power generation was also evaluated, however it was determined the average wind speed for this area of New Jersey is below the necessary wind speed to make wind power a viable alternative.

Energy Procurement Recommendations:

It is recommended that the Church utilize a 3rd party purchasing approach to energy and should do so for both electricity and natural gas.

Further recommendations are outlined in the Energy Procurement Section of this report that could assist the Church in finding additional savings through their utility bills.

Maintenance and Operational Recommendations:

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

1. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.
2. Maintain all weather stripping on windows and doors.

3. Clean all light fixtures to maximize light output.
4. Provide more frequent air filter changes to decrease overall system power usage and maintain better Indoor Air Quality (IAQ).
5. Confirm that outside air economizers on the packaged rooftop units are functioning properly to take advantage of free cooling and avoid excess outside air during occupied periods.
6. Verify all HVAC control systems are utilizing setback and scheduling capabilities.
7. Shutdown all non-essential equipment during unoccupied periods.

II. INTRODUCTION

This comprehensive energy audit covers the 11,863 square foot Unitarian Universalist Church at Washington Crossing located in Titusville, New Jersey.

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

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

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

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

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

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

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

III. METHOD OF ANALYSIS

This audit is consistent with an ASHRAE Level 2 Energy Audit. The cost and savings for each measure is ± 20%. The evaluations are based on engineering estimations and industry standard calculation methods. More detailed analyses would require engineering simulation models, hard equipment specifications, and contractor bid pricing.

Post site visit work includes evaluation of the information gathered, researching possible conservation opportunities, organizing the audit into a comprehensive report, and making recommendations on HVAC, lighting and building envelope improvements. Data collected is processed using energy engineering calculations to anticipate energy usage for each of the proposed energy conservation measures (ECMs). The actual building's energy usage is entered directly from the utility bills provided by the owner. The anticipated energy usage is compared to the historical data to determine energy savings for the proposed ECMs. It is pertinent to note, that the savings noted in this report are not additive. The savings for each recommendation is calculated as standalone energy conservation measures. Implementation of more than one ECM may in some cases affect the savings of each ECM. The savings may in some cases be relatively higher if an individual ECM is implemented in lieu of multiple recommended ECMs. For example implementing reduced operating schedules for inefficient lighting will result in a greater relative savings. Implementing reduced operating schedules for newly installed efficient lighting will result in a lower relative savings, because there is less energy to be saved.

The project / entity summary tables are based on the implementation of multiple measures. The analysis is reviewed and determined if the nature of the ECMs will cause a major conflict of the overall savings. When additive measures do not cause a major effect on the overall savings the ECMs are included. Where a major conflict is identified, the combined savings is evaluated appropriately to ensure the overall estimates are ± 20%.

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

Cost savings are calculated based on the actual historical energy costs for the facility. Installation costs include labor and equipment costs to estimate the full up-front investment required to implement a change. Costs are derived from Means Cost Data, industry publications, and local contractors and equipment suppliers. The NJ Smart Start Building® program incentives savings (where applicable) are included for the appropriate ECM's and subtracted from the installed cost. Maintenance savings are calculated where applicable and added to the energy savings for each ECM. The life-time for each ECM is estimated based on the typical life of the equipment being replaced or altered. The costs and savings are applied and a simple payback, simple lifetime savings, and simple return on investment are calculated. See below for calculation methods:

ECM Calculation Equations:

$$\text{Simple Payback} = \left(\frac{\text{Net Cost}}{\text{Yearly Savings}}\right)$$

$$\text{Simple Lifetime Savings} = (\text{Yearly Savings} \times \text{ECM Lifetime})$$

$$\text{Simple Lifetime Return on Investment (ROI)} = \frac{(\text{Simple Lifetime Savings} - \text{Net Cost})}{\text{Net Cost}}$$

$$\text{Lifetime Maintenance Savings} = (\text{Yearly Maintenance Savings} \times \text{ECM Lifetime})$$

$$\text{Net Present Value} = \sum_{n=0}^{N}\left(\frac{\text{Cash Flow of Period}_n}{(1+\text{DR})^n}\right)$$

$$\text{Internal Rate of Return (IRR)} \rightarrow \text{Net Present Value} = 0 = \sum_{n=0}^{N}(\frac{\text{Cash Flow of Period}_n}{(1+\text{IRR})^n}$$

Net Present Value calculations are based on Discount Rate (DR) of 3%.

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

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

The facility receives electric delivery and supply from PSE&G under their GLP (General Lighting & Power Service) rate structure. The Church receives a monthly religious credit of $53.50 on their electric bill. The Church has not contracted with a Third Party Supplier to provide electric commodity supply (generation) service. The electric utility measures consumption in kilowatt-hours (KWH) and maximum demand in kilowatts (KW). One KWH usage is equivalent to 1000 watts running for one hour. One KW of electric demand is equivalent to 1000 watts running at any given time. Rates used in this report reflect the historical data received for the facility.

The gas usage profile within each facility report shows the actual natural gas energy usage for the facility. The gas utility measures consumption in cubic feet x 100 (CCF), and converts the quantity into Therms of energy. One Therm is equivalent to 100,000 BTUs of energy. The facility received Natural Gas through Elizabethtown Gas under the General Delivery - Heat Rate Service. The Church has not contracted with a Third Party Supplier, to provide natural gas commodity service.

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

Description	Average
Electricity	17.1¢ / kWh
Natural Gas	$1.10 / therm

Table 5
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: PSE&G
Rate: GLP
Meter No: 9198773
Account No: 65 901 715 05
Other: On-Site Solar Generation

MONTH OF USE	CONSUMPTION KWH	DEMAND KW	TOTAL BILL
May-13	3,311	29.7	$605
Jun-13	4,047	40.9	$852
Jul-13	5,047	40.5	$981
Aug-13	3,971	28.5	$605
Sep-13	3,250	29.9	$387
Oct-13	3,007	25.0	$332
Nov-13	4,379	21.6	$523
Dec-13	5,455	21.3	$631
Jan-14	5,359	19.8	$632
Feb-14	4,970	20.2	$604
Mar-14	3,651	18.3	$437
Apr-14	3,819	14.8	$334
Totals	**50,265**	**40.9 Max**	**$6,922**

AVERAGE DEMAND 25.9 KW average
AVERAGE RATE $0.171 $/kWh

Note 1: The facility purchases approximately 40,368 kWh from the grid. The on-site solar panels generate approximately 9,897 kWh annually.
Note 2: The average rate is based on the electric purchased from grid.

Figure 1
Electricity Usage Profile

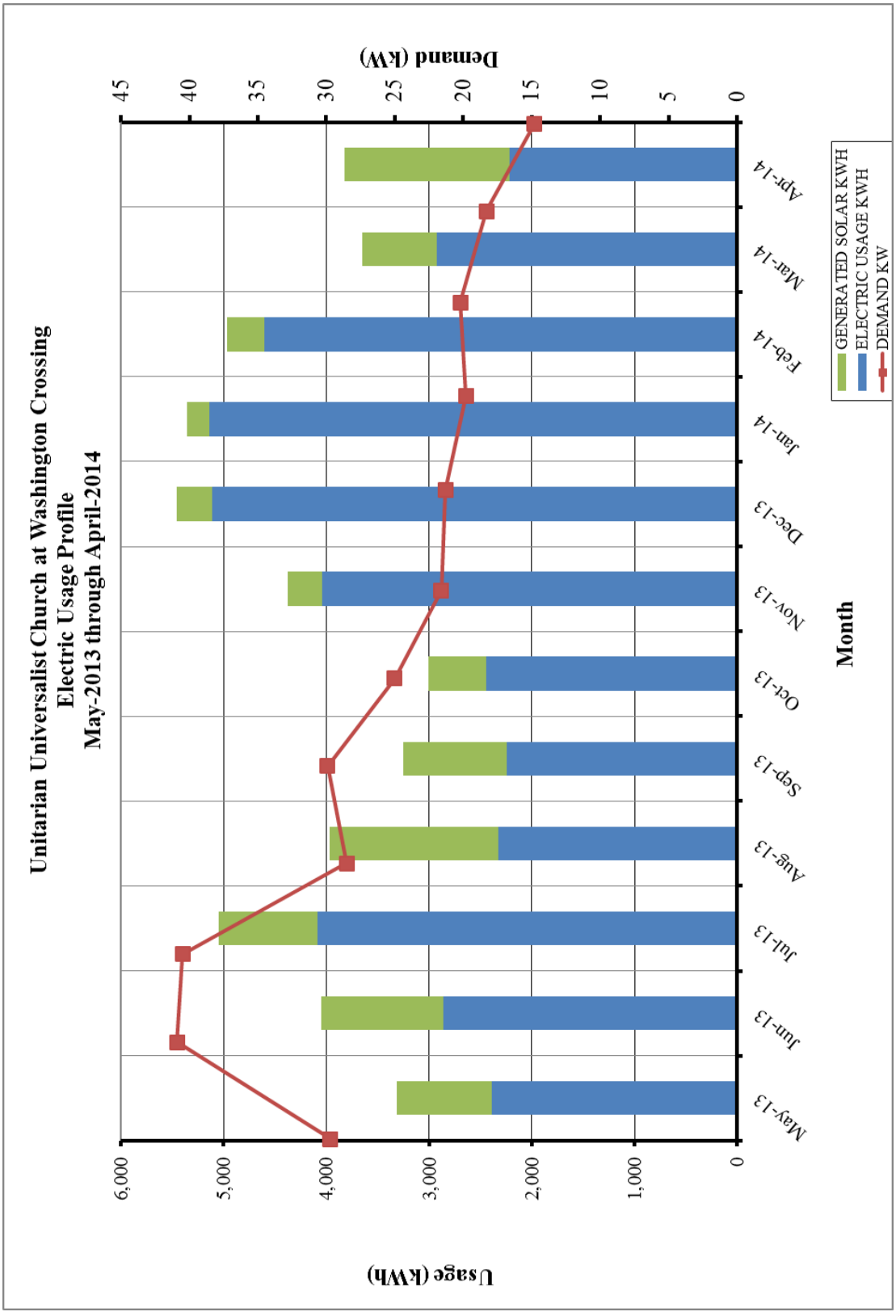
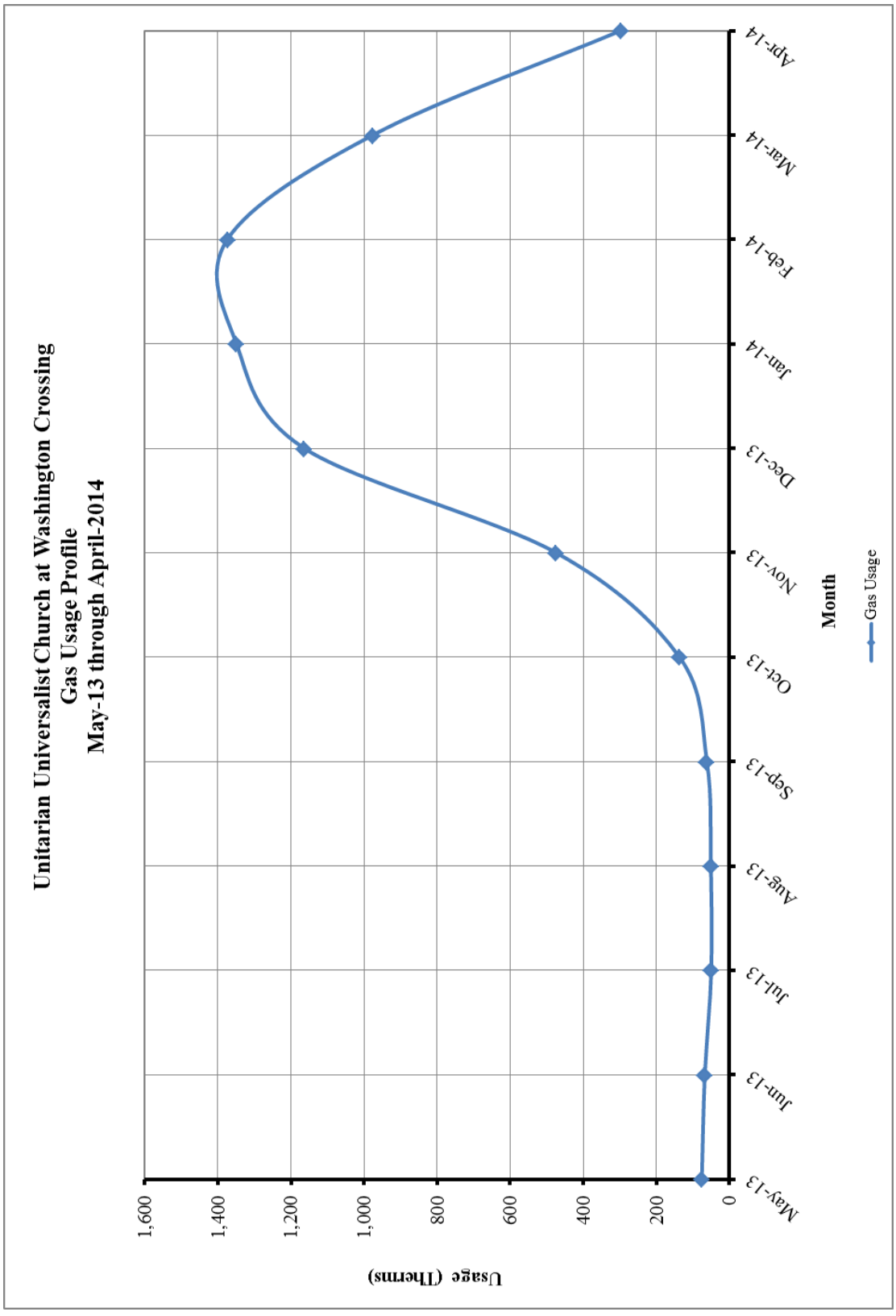


Table 6
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider:	Elizabethtown Gas	
Rate:	General Delivery - Heat	
Meter No:	06335790	
Account No:	1393259581	
Third Party Utility Provider:	N/A	
TPS Meter No:	N/A	
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
May-13	75.90	$95.22
Jun-13	67.50	$87.38
Jul-13	50.00	$68.44
Aug-13	51.10	$67.87
Sep-13	62.00	$78.44
Oct-13	137.40	$151.93
Nov-13	475.70	$476.15
Dec-13	1,164.70	$1,163.81
Jan-14	1,349.50	$1,427.90
Feb-14	1,374.20	$1,612.88
Mar-14	975.60	$1,116.00
Apr-14	296.70	$342.70
TOTALS	**6,080.30**	**$6,688.72**
AVERAGE RATE:	**$1.10**	**$/THERM**

Figure 2
Natural Gas Usage Profile



B. Energy Use Index (EUI)

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

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

The site and source EUI for this facility is calculated as follows:

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

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

Table 7
Facility Energy Use Index (EUI) Calculation

ENERGY USE INTENSITY CALCULATION						
ENERGY TYPE	**BUILDING USE**			**SITE ENERGY**	**SITE-SOURCE RATIO**	**SOURCE ENERGY**
	kWh	**Therms**	**Gallons**	**kBtu**		**kBtu**
ELECTRIC	42,139.0			143,778	3.140	451,464
NATURAL GAS		6,080.3		608,030	1.050	638,432
SOLAR	9,897.0		0.0	33,769	1.000	33,769
TOTAL				785,577		1,123,664
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA			11,863	SQUARE FEET		
BUILDING SITE EUI			*66.22*	kBtu/SF/YR		
BUILDING SOURCE EUI			*94.72*	kBtu/SF/YR		

According to the Energy Star Statement of Energy Performance data by building type, Religious Worship national average Source EUI is 108.3 and national average site EUI is 75.7. Based on the above source energy comparison the Unitarian Universalist Church at Washington Crossing is operating more efficiently, compared to buildings of similar type.

C. EPA Energy Benchmarking System

The United States Environmental Protection Agency (EPA) in an effort to promote energy management has created a system for benchmarking energy use amongst various end users. The benchmarking tool utilized for this analysis is entitled Portfolio Manager. The Portfolio Manager tool allows tracking and assessment of energy consumption via the template forms located on the ENERGY STAR website (www.energystar.gov).

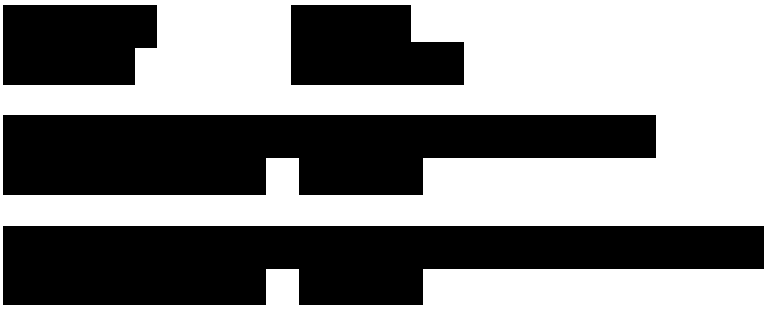
The importance of benchmarking for local government municipalities is becoming more important as utility costs continue to increase and emphasis is being placed on carbon reduction, greenhouse gas emissions and other environmental impacts.

Based on information gathered from the ENERGY STAR website, Government agencies spend more than $10 billion a year on energy to provide public services and meet constituent needs. Furthermore, energy use in commercial buildings and industrial facilities is responsible for more than 50 percent of U.S. carbon dioxide emissions.

It is vital that local government municipalities assess facility energy usage, benchmark energy usage utilizing Portfolio Manager, set priorities and goals to lessen energy usage and move forward with priorities and goals.

In accordance with the Local Government Energy Audit Program, Concord has created an ENERGY STAR account for the Church to access and monitor the facility's yearly energy usage as it compares to facilities of similar type. The login page for the account can be accessed at the following web address; the username and password are also listed below:

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



The above log in information allows the owner to continue to utilize Portfolio Manager to track and monitor their energy performance. For further direction on how to use the Portfolio Manager Tool such as adding properties, entering data, and viewing results, see **Portfolio Manager Quick Start Guide Appendix**; additional training material and live training sessions provided by Energy Star can be found on their website at www.energystar.gov/buildings/training

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

Table 8
ENERGY STAR Performance Rating

ENERGY STAR PERFORMANCE RATING		
FACILITY DESCRIPTION	**ENERGY PERFORMANCE RATING**	**NATIONAL AVERAGE**
UUCWC	62	50

Refer to **Statement of Energy Performance Appendix** for the detailed energy summary for each facility.

V. FACILITY DESCRIPTION

The 11,863 square-foot Unitarian Universalist Church at Washington Crossing is a single story building with a basement in Titusville, New Jersey. The original building was built in 1975 and a major addition/renovation was built in 1995. The basement of the building consists of classrooms, kitchen, multi-purpose room, restrooms, mechanical room, storage rooms, etc. The remainder of the building contains the entrance lobby, the Chapel/Sanctuary, nursery, music director's office, staff offices, the minister's office, classrooms, the Crossing Room, restrooms and storage.

Occupancy Profile

On Sundays the building is occupied by an average of 130 to 150 people from approximately 7:30 AM until 2:00 PM. During the weekday, there are occasional staff personnel in the building performing maintenance and administrative tasks. Each evening from Monday through Thursday there are various meetings held at the facility attended by an average of 15 to 20 people.

Building Envelope

The typical exterior wall construction for the original building consists of stucco finish on metal lath, building wrap, 12" concrete block units, 1/2" exterior gypsum sheathing, 6" batt insulation and 5/8" painted gypsum board. The typical roof construction of the original building consists of a modified bitumen roofing, rigid insulation (R-11 minimum) and wooden roof deck on web joists.

The 1995 additions consist of an EPOM membrane roofing system, ½" wafer board on ¾" CDX plywood, 6" batt insulation, and a continuous vapor barrier. The typical exterior wall construction consists of split face concrete block, ½" gypsum board on ¾" furring, ¾" fiberglass ridged insulation and a vapor barrier.

The windows/doors throughout the facility are comprised of aluminum window systems with insulated glass from ¼" to 1" in thickness.

A survey of the exit doors and exterior windows was conducted using an infrared gun thermometer. Appendix F shows the results of this survey which indicate that only two (2) entrance/exit doors had any appreciable infiltration of warm air. These two (2) double doors should have new weather seals installed at the middle and bottom of each door.

HVAC Systems

The Church is primarily conditioned by five (5) new packaged heating and cooling rooftop units.

The lower level classrooms are conditioned by a York Model ZJ049 packaged rooftop unit, RTU-1. This unit is rated for 4 tons of DX cooling with an efficiency of 11.8 EER and contains a gas furnace section rated for 120 MBH of heating at 80% efficiency. This unit is equipped

with a temperature economizer with power exhaust. The unit was manufactured in 2013 and is in good condition.

The upper level classrooms are conditioned by a York Model ZJ049 packaged rooftop unit, RTU-2. This unit is rated for 4 tons of DX cooling with an efficiency of 11.8 EER and contains a gas furnace section rated for 120 MBH of heating at 80% efficiency. This unit is also equipped with a temperature economizer with power exhaust. The unit was manufactured in 2013 and is in good condition.

During the site inspection, it was observed that Room 202was colder than the other classrooms and had a noise level issue caused by the air velocity thru the supply air diffuser. Air flow velocity in ducts should be kept within certain limits to avoid noise and unacceptable friction loss and energy consumption. The three (3) upper level classrooms need to be air balanced so that more uniform space temperatures can be obtained in each of the classrooms.

The meeting room is conditioned by a York Model ZJ090 packaged rooftop unit, RTU-3. This unit is rated for 7.5 tons of DX cooling with an efficiency of 12.2 EER and contains a gas furnace section rated for 180 MBH of heating at 80% efficiency. This unit is also equipped with an economizer. The unit was manufactured in 2013 and is in good condition.

The chapel is conditioned by a York Model ZJ240 packaged rooftop unit, RTU-4. This unit is rated for 20 tons of DX cooling with an efficiency of 11.6 EER and contains a gas furnace section rated for 400 MBH of heating at 80% efficiency. This unit is constant volume and is also equipped with an economizer. The unit was manufactured in 2013 and is in good condition.

The entrance lobby and nursery are conditioned by a York Model ZJ037 packaged rooftop unit, RTU-5. This unit is rated for 3 tons of DX cooling with an efficiency of 11.8 EER and contains a gas furnace section rated for 80 MBH of heating at 80% efficiency. This unit is constant volume and is also equipped with an economizer. The unit was manufactured in 2013 and is in good condition.

The minister and staff offices are conditioned by a York Model YCJF36 rooftop, split, air-cooled condensing unit, CU-1. This rooftop condensing unit is rated for 3 tons of DX cooling with an efficiency of 14.5 SEER. The offices are heated by a York Model TM9X080 split air handling unit located in the basement mechanical room, AHU-1. This unit contains a gas furnace section rated for 80 MBH of heating at 95.5% AFUE. This split system was manufactured in 2013 and is in good condition.

During the site inspection, it was observed that the Minister's office was quite warm due to window solar gain even though Hunter-Douglas double-honeycomb shades have been installed. With conventional clear glazing, a significant amount of solar radiation passes through the window. Concord recommends that a high performance low-E window system be installed for this office. A glazing design for maximizing energy efficiency during the under-heated periods would ideally allow all the solar spectrum pass through, but would block the re-radiation of heat from the inside of the space.

Exhaust System

The air is exhausted from the toilet rooms via dedicated exhaust fans located on the roof. The exhaust system for the kitchen consists of a long run of ductwork from the kitchen to an outside wall with an inline exhaust fan located in the storage room of the meeting room.

The exhaust system is undersized for the kitchen size and heat load. In addition, when Concord performed the energy audit, the room exhaust fan was running, the make-up air for the kitchen was not, and the room was under a negative pressure. Concord recommends that the kitchen exhaust/make-up-air system be further investigated.

HVAC System Controls

The HVAC systems within the building are controlled by Honeywell FocusPRO® 7-day programmable digital thermostats. There is one programmable thermostat for each rooftop unit and the split air handling unit. The temperature set-point for the winter is 68°F and the summer temperature set-point is 74°F. The thermostats do have a setback function which is currently being utilized. The heating season setback is 60°F and the cooling season setback is 80°F.

Energy economizers and reset controls are installed on the forced-air heating systems, the rooftop air conditioning and the domestic water heaters.

Domestic Hot Water

Domestic hot water is supplied by two (2) gas-fired, automatic storage water heaters manufactured by State Industries. The newer unit is a Model GS640 with a rated input of 40 MBH, a storage capacity of 40 gallons and an efficiency of 90%. The other unit is a Model SR8 40 with a rated input of 50 MBH, a storage capacity of 40 gallons and an efficiency of 80% (when new). This unit is 20 years old and beyond its service life of 12 years.

Kitchen

The kitchen was recently renovated with two (2) Energy Star rated refrigerator and freezer units; a new Energy Star rated gas oven/griddle/hot top manufactured by Hobart; a Model AF-3D low energy dish washer manufactured by Aqua Solutions; and a dish washer nozzle that complies with EPACT 2005.

Solar Array

The photovoltaic array on the roof of the original building was installed in 2008 and consists of 44 Sharp Electronics Model ND-216U2. The 216-Watt rated modules are in four series strings with 11 modules per string for a combined total rated output of 9.1 kW. The system includes two (2) SMA Model SB4000 inverters and an AC combiner panel. Each September, the local electric utility company performs an anniversary true up credit for generation delivered to the grid.

Lighting

The lighting for the Church is controlled in various ways. The exterior lighting is set on a timer from 8:00 pm to 10:00 pm. The interior spaces are controlled by occupancy sensors that are either wall switch or ceiling mounted units. The crossing rooms, meeting room and chapel have dimming control systems. Most of the facility (except the exterior lighting) has been upgraded to more efficient lighting technology.

Refer to the Investment Grade lighting Audit Appendix for a detailed list of the lighting throughout the facility and estimated operating hours per space.

VI. MAJOR EQUIPMENT LIST

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

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

VII. ENERGY CONSERVATION MEASURES

ECM #1: Lighting Upgrade – General

Description:

The majority of the interior lighting throughout the Unitarian Universalist Church is provided with fluorescent fixtures with, 32W T8 lamps and electronic ballasts. Additionally, there are several areas that contain CFL, LED and incandescent fixtures. These fixtures can be replaced and retrofit with new LED type fixtures and lamps.

This ECM includes replacing and retrofitting the interior lighting with new LED type lamps and fixtures. It is recommended the Church consult with a professional engineer prior to retrofitting or replacing fixtures to ensure code required minimum light levels will be met.

Energy Savings Calculations:

The **Investment Grade Lighting Audit Appendix** outlines the hours of operation, proposed retrofits, costs, savings, and payback periods for each set of fixtures in the each building.

LIGHTING UPGRADE SAVINGS SUMMARY	
DESCRIPTION	**SAVINGS**
Electric Demand Savings (kW)	2.3
Electric Usage Savings (kWh)	2,271
Electric Cost Savings ($)	$388

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$21,220
NJ Smart Start Equipment Incentive ($):	$5,600
Net Installation Cost ($):	$15,620
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$388
Total Yearly Savings ($/Yr):	$388
Estimated ECM Lifetime (Yr):	15
Simple Payback	40.3
Simple Lifetime ROI	-62.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$5,820
Internal Rate of Return (IRR)	-10%
Net Present Value (NPV)	($10,988.08)

ECM #2: Lighting Upgrade – Exterior Lighting

Description:

The exterior lighting at the Unitarian Universalist Church is currently lit by metal halide, incandescent and compact fluorescent fixtures. The exterior would be better served with more efficient LED lighting system. Concord Engineering recommends upgrading the lighting to an energy-efficient LED lighting system that includes LED lamps and fixtures for the existing exterior lighting.

This ECM would replace the existing exterior lamps and fixtures with equivalent LED lamps and fixtures.

Energy Savings Calculations:

A detailed Investment Grade Lighting Audit can be found in **Investment Grade Lighting Audit Appendix** that outlines the proposed retrofits, costs, savings, and payback periods.

LIGHTING CONTROLS SAVINGS SUMMARY	
DESCRIPTION	**SAVINGS**
Electric Demand Savings (kW)	0.8
Electric Usage Savings (kWh)	826
Electric Cost Savings ($)	$141

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$5,236
NJ Smart Start Equipment Incentive ($):	$300
Net Installation Cost ($):	$4,936
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$141
Total Yearly Savings ($/Yr):	$141
Estimated ECM Lifetime (Yr):	15
Simple Payback	35.0
Simple Lifetime ROI	-57.2%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$2,115
Internal Rate of Return (IRR)	-9%
Net Present Value (NPV)	($3,253.00)

ECM #3: De-Stratification Fans

Description:

The Chapel area at the Unitarian Universalist Church is heated and cooled through a single gas-fired rooftop unit. In rooms with high ceilings typically stratification of heated air occurs, resulting in air at ceiling level being warmer than the floor. Since temperature at the floor level dictates the comfort of occupants and is typically the location of the thermostat controlling the system, this results in additional operating hours to satisfy space conditions.

This ECM would install three (3) Airius Model A25 de-stratification fans in the chapel to be suspended from the ceiling, with all require electrical wiring and supports. These fans should only operate during heating season to help maintain a higher floor temperature and reduce cycling time.

Energy Savings Calculations:

The calculations are based on the manufacturer's percent savings utilizing the height of the ceiling and associated temperature differential between floor and ceiling. The temperature differential in this case was estimated at 12.6 degrees Fahrenheit.

$$\text{Heating Energy (kBtu)} = 80\%\ \text{Oversize Factor} \times \text{Space Heating Capacity} \times \text{HDD} \times \text{Adj. Factor} \times 24\frac{\text{hr}}{\text{day}} \times \frac{1}{\text{Design } \Delta T} \times \frac{1}{\text{Efficiency}}$$

$$\text{Savings (kBtu)} = \text{Heating Energy} \times \text{Percent Savings}$$

$$\text{Fan Power Penalty (kWh)} = \text{Fan Power (W)} \times \text{Winter Operating Hours} \times \frac{1\ \text{kWh}}{1{,}000\ \text{W}}$$

DESTRATIFICATION FAN ANALYSIS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Description	Existing Church Conditions	Proposed Church w/ Fans	
Space Heating Type	Gas Furnace	Gas Furnace	
Space Heating Capacity (MBH)	400	400	
Heating Efficiency (COP)	4.6	4.6	
Heating Degree Days (65 F)	4824	4824	
Degree Day Adjustment Factor	0.54	0.54	
Space Ceiling Height (ft)	25	25	
Ceiling-Floor ΔT (^{o}F)	13	13	
Percent Energy Savings	-	22%	
Destrat Fan Power (kWh)	-	151	
Heating Energy (kBtu)	86,983	67,847	
Electric Rate ($/kWh)	$0.171	$0.171	
Natural Gas ($/Therm)	$1.100	$1.100	
ENERGY SAVINGS CALCULATIONS			
Electric Usage (kWh)	0	151	(151)
Natural Gas Usage (Therms)	870	678	191
Energy Cost ($)	$957	$772	$185
COMMENTS:	Ceiling-Floor Temperature Differential Based on 0.5 F per Foot		

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$6,900
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$6,900
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$185
Total Yearly Savings ($/Yr):	$185
Estimated ECM Lifetime (Yr):	15
Simple Payback	37.3
Simple Lifetime ROI	-59.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$2,775
Internal Rate of Return (IRR)	-10%
Net Present Value (NPV)	($4,691.48)

ECM #4: Ultra High-Efficiency Gas-Fired Domestic Hot Water Heater

Description:

Domestic hot water for the entire facility is presently provided by two (2) State Industries 40-gallon, gas-fired hot water heaters rated at 40 MBH and 50 MBH. These units have a rated thermal efficiency of only 80% and a recovery of 44 and 53 gallons per hour at a temperature rise of 100°F.

This ECM would replace the two (2) existing gas-fired, domestic water heaters with one (1) Bradford White eF Series with a 95% thermal efficiency. The new unit is rated at 120 MBH, has a 60-gallon storage tank, and a recovery of 154 gallons per hour at a temperature rise of 90°F.

Energy Savings Calculations:

Energy Density for an Religious Worship building = 0.9 kBtu / SF / year

$$DHW\ \ Heat\ Usage = Energy\ Density\left(\frac{kBtu\ yr}{SF}\right) \times Building\ Square\ Footage\ \ (SF)$$

$$DHW\ Total\ Usage = \frac{Dom\ HW\ \ Heat\ Cons.(Btu)}{Heating\ \ Eff.(\%) \times Fuel\ \ Heat\ Value\left(\frac{BTU}{Fuel\ Unit}\right)}$$

$$Energy\ Cost = Heating\ \ Fuel\ Usage(Fuel\ Units) \times Ave\ \ Fuel\ \ Cost\left(\frac{\$}{Fuel\ Unit}\right)$$

DOM. HOT WATER HEATER CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Two (2) Existing Hot Water Heater	One (1) Extra High-Efficiency Heater	
Building Type	Public Assembly		
Building Square-foot	11,860	11,860	
Domestic Water Usage, kBtu	10,674.00	10,674.00	
DHW Heating Fuel Type	Gas	Gas	
Heating Efficiency	80%	95%	15%
Total Usage (kBTU)	13,343	11,236	2,107
Nat Gas Cost ($/Therm)	$ 1.10	$ 1.10	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Natural Gas Usage (Therms)	133	112	21
Energy Cost ($)	$147	$124	$23
COMMENTS:	Savings are based on Energy Information Administration Commercial Building Energy Consumption Survey 2003 Information		

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$6,500
NJ Smart Start Equipment Incentive ($):	$240
Net Installation Cost ($):	$6,260
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$23
Total Yearly Savings ($/Yr):	$23
Estimated ECM Lifetime (Yr):	15
Simple Payback	272.2
Simple Lifetime ROI	-94.5%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$345
Internal Rate of Return (IRR)	-24%
Net Present Value (NPV)	($5,985.43)

Note: A like-kind replacement comparison is when a piece of equipment should be replaced and the cost of the new regular efficiency unit is compared to upgrading the system with a high efficiency piece of equipment. Comparing the difference between a like-kind replacement and a new high efficiency replacement, the difference in cost is estimated to be $2400, where there are no additional savings from upgrading to a like-kind hot water heater. The resulting payback for this measure would be 93.9 years.

ECM #5: Building Weatherization

Description:

A detailed survey was conducted to review potential building envelope upgrades around the entire facility. Leaky doors, lack of weather stripping, improperly adjusted door closers, etc. can all contribute to infiltration of cold or hot/humid air. For some of the perimeter doors, the weather stripping is worn and/or the door is not the square in the frame allowing infiltration to enter conditioned spaces.

Concord Engineering recommends replacing all old weather stripping on perimeter doors. This ECM involves sealing leaks in the building envelope with various weatherproofing measures such as weather stripping exterior doors. The following measures are recommended:

1. Weather strip and adjust closers and latches on **2** double doors

Savings for the building envelope upgrade are based on reducing air infiltration. The standard crack method was used for calculations and is outlined below:

Energy Savings Calculations:

$$\text{Heating\& Cooling Load} = \text{CFM} \times 1.08 \times \Delta\text{T}$$

$$\text{Heating Leakage Energy} = \frac{\text{Heat Load}\left(\frac{\text{Btu}}{\text{hr}}\right) \times \text{HDD}_{\text{Mod}} \times 24}{\Delta\text{T} \times \text{Fuel Conversion Factor}\left(100{,}000\ \frac{\text{Btu}}{\text{Therm}}\right) \times \text{Equipment Efficiency}}$$

$$\text{Cooling Leakage Energy} = \frac{\text{Cooling Load}\left(\frac{\text{Btu}}{\text{Hr}}\right) \times \text{Full Load Cooling Hours}}{\text{EER}\left(\frac{\text{Btu}}{\text{Wh}}\right) \times 1000\ \text{watts}}$$

WEATHER STRIPPING			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Doors	Newly Weather Sealed Doors	
Gap under each door (Inch)	0.125	0.079	0.281
Total Leakage Area per Door (Square Inch) - 3 Foot Wide Door	28.00	18.00	10
Qty of exterior doors	2	2	
Airflow Leakage Rate (Winter months) (cfm)	113	74	167
Heat Load (Btu/Hr)	6,841	5,292	11,907
Heating Degree Days (HDD)	4,824	4,824	
Fuel Heat Value (BTU / Therm)	100,000	100,000	
Heating Efficiency (%)	80%	80%	
Natural Gas Cost ($/Therm)	1.10	1.10	
Full Load Cooling Hours	800.00	800.00	
Average Energy Efficiency Ratio (BTU/Wh)	11.80	11.80	
Electric Energy Cost ($/kWh)	0.171	0.171	
Cooling Season Temperature Difference - "ΔT"	20.00	20.00	
Airflow Leakage Rate (Summer months) (cfm)	106	68	153
Cooling Load (Btu/Hr)	2,322	1,493	3,358
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Leakage Energy (Therms)	97	75	22
Leakage Energy (kWh)	157	101	56
Gas Energy Cost ($)	$107	$83	$24
Electric Energy Cost ($)	$27	$17	$10
Total Energy Savings			$34
COMMENTS:			

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$200
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$200
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$34
Total Yearly Savings ($/Yr):	$34
Estimated ECM Lifetime (Yr):	10
Simple Payback	5.9
Simple Lifetime ROI	70.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$340
Internal Rate of Return (IRR)	11%
Net Present Value (NPV)	$90.03

ECM #6: Window Film

Description:

The facility envelope is a mixture of single and double pane windows with an average quality window tint applied to the windows.

The windows account for significant energy use through leakage heat loss and conductive heat loss. The age and condition of the windows contribute to higher thermal (conductive) energy loss. Retrofitting the existing windows with a thermal barrier for energy efficiency aimed at high heat rejection and high light transmission will allow for some energy savings.

This ECM includes the retrofit of all existing window tint in the facility with Hüper Optik commercial window film. These technologies create a more comfortable environment while reducing HVAC consumption.

Energy Savings Calculations:

$$q\ (Heat\ Transfer) = U\ \left(\frac{Btu}{Hr * SF * °F}\right) \times Area\ (SF) \times Degree\ Days \times 24$$

WINDOW TINT CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Description:	Normal Tint Windows	High Efficiency Window Tints	
Window (SF)	880	880	
U-Value (BTU/HR/SF*°F)	0.60	0.45	0.15
Degree Days Heat (65°F)	6212	6212	
Degree Days Cool (65°F)	1013	1013	
Natural Gas Cost ($/Therm)	$1.10	$1.10	-
Electric Cost ($/kWh)	$0.171	$0.171	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Electric Usage (kWh)	423,200	422,844	356
Natural Gas Usage (Therm)	8,864	8,667	197
Energy Cost Savings ($)	$82,118	$81,840	$277
Comments:			

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$10,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$10,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$277
Total Yearly Savings ($/Yr):	$277
Estimated ECM Lifetime (Yr):	15
Simple Payback	36.1
Simple Lifetime ROI	-58.5%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	$4,155
Internal Rate of Return (IRR)	-9%
Net Present Value (NPV)	($6,693.19)

ECM #7: Water Conservation

Description:

The Unitarian Universalist Church utilizes standard plumbing fixtures. The typical water faucet consumption only meets the minimum federal required standard for water efficiency. New fixtures are available that use less water than today's requirements and can add up to significant water reduction over a long period.

This ECM includes the retrofitting of the existing faucets within the facility with new low flow aerators. The estimated usage of the plumbing fixtures is based on the total population of the facility. The number of plumbing fixtures to be replaced is based on observations of the facility. (Please note that the estimate of occupants for the Church is an estimate based on daily employees at the facility)

Energy Savings Calculations:

Faucets:

$$\text{Water Usage} = \text{Occupancy}\left(\frac{\text{Days}}{\text{yr}}\right) \times \frac{\text{Uses}}{\text{Day}} \times \text{Duration}\left(\frac{\text{min}}{\text{Use}}\right) \times \text{Fixture}\left(\frac{\text{Gal}}{\text{Min}}\right)$$

$$\text{Natural Gas Cost (Therms)} = \text{Faucet Water Consumption (Gallons)} \times \frac{8.33\,\text{lbs}}{\text{Gal}} \times \Delta T(70F) \times \frac{\text{Therm}}{100{,}000\ \text{BTU}}$$

$$\text{Natural Gas } (Therms) = \text{Faucet Water Usage (Gal)} \times 8.33\frac{\text{lbs}}{\text{Gal}} \times \text{Specific Heat (1)} \times \Delta\text{T(70°F)} \times \frac{Therm}{100{,}00\ \text{Btu}} \times \frac{1}{\text{HWH Efficiency}}$$

LOW FLOW WATER SAVING DEVICES			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Quantity of Sinks	7	7	
Flow Rate (GPM)	2.2	0.5	1.7
Device Usage (min per day)	10	10	
Facility Operation (days / year)	125	125	
Heat Content of Water (Btu/gal/°F)	8.33	8.33	
Temperature Rise (°F)	70.0	70.0	
Efficiency of Heating System (%)	80%	80%	
Conversion Factor for Electric	3413	3413	
Conversion Factor for Gas	100000	100000	
Natural Gas Rate ($/therm)	$1.100	$1.100	
Water Rate ($/1000gal)	$15.000	$15.000	
ENERGY SAVINGS CALCULATIONS			
Natural Gas Usage (Therm)	70	16	54
Water Usage (gallons)	19,250	4,375	14,875
Energy Cost ($)	$366	$83	$283
COMMENTS:	Heating Savings based on 50% Hot Cold Mix		

The cost for installation and materials is based on 7 faucet aerators. There are no Smart Start rebates for installation of low flow plumbing fixtures.

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$210
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$210
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$283
Total Yearly Savings ($/Yr):	$283
Estimated ECM Lifetime (Yr):	10
Simple Payback	0.7
Simple Lifetime ROI	1247.6%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$2,830
Internal Rate of Return (IRR)	135%
Net Present Value (NPV)	$2,204.05

ECM #8: Air Balance Rooms 201, 202 and 203 & Re-Calibrate Thermostat

Description:

The church has a meeting room and two (2) classrooms on the second floor (Rooms 201, 202, and 203) that are not properly balanced for the designed amount of air or airflow. The rooms have outside ventilation air and heating/air conditioning provided by a new packaged rooftop unit and the unit is controlled by a 7-day programmable thermostat in Room 202. During both of the site inspections, Room 202 was measured with a calibrated thermometer and read 72 °F. The thermostat was in the unoccupied mode with an unoccupied set point of 80 °F. In addition, the supply air grille in Room 202 was making a loud noise caused by the air velocity thru the supply air diffuser. When air flows through the ducts and supply diffusers at a higher velocity than intended, noise is generated. Because the other two rooms have thru-the-wall transfer grilles, their temperature was between 74-75 °F.

The 7-day programmable thermostat in Room 202 has the capability to run programmed temperature and occupancy control of the spaces. This allows the rooms to operate on a time schedule that can automatically adjust temperature set points and switch between an occupied and unoccupied mode. It is advantageous to switch to unoccupied mode as this can adjust to more economical temperature set points and can reduce outside air volume that is required to be conditioned and can save substantial amounts of energy.

The rooftop unit for these rooms has historically been running at 68° F heating and 74° F cooling during occupied mode. The occupants have the ability to locally modify the set point to whatever is comfortable. These set points were adjusted and occupants are limited to a ±4° F adjustment at local thermostats. The unoccupied schedule has a set point of 60° F heating and 80° F cooling. The temperature in Room 202 is running at 6 ° F below the setpoint for cooling during unoccupied hours. This, of course, wastes energy.

Therefore, the thermostat needs to be re-calibrated to read the actual space temperature in Room 202 and the air needs to be balanced so that the proper velocity and amount of air is delivered to each room (eliminating the noise from the excessive airflow in Room 202). This would involve a professional air balancing company that can also re-calibrate the thermostat.

Energy Savings Calculations:

The energy savings for the corrected air balance of the three (3) rooms and re-calibration of the thermostat to read the correct temperature in Room 202 using the present occupancy schedule and temperature set points can be estimated at 5% electric savings for the rooftop serving this area. The electric consumed by this rooftop unit was estimated using the following equation:

$$Energy\ Consumed = \left(\frac{\frac{Btu}{hr}}{1000}\right) \times \left(\frac{1}{SEER}\right) \times EFLH(Equivalent\ Full\ Load\ hours)$$

$$Energy\ Savings = Energy\ Consumed \times 5\%\ Savings$$

Energy Savings Summary:

ECM #8 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,500
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$2,500
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$22
Total Yearly Savings ($/Yr):	$22
Estimated ECM Lifetime (Yr):	15
Simple Payback	113.6
Simple Lifetime ROI	-86.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$330
Internal Rate of Return (IRR)	-19%
Net Present Value (NPV)	($2,237.37)

VIII. RENEWABLE/DISTRIBUTED ENERGY MEASURES

Globally, renewable energy has become a priority affecting international and domestic energy policy. The State of New Jersey has taken a proactive approach, and has adopted in its Energy Master Plan a goal of 30% renewable energy by 2020. To help reach this goal New Jersey created the Office of Clean Energy under the direction of the Board of Public Utilities and instituted a Renewable Energy Incentive Program to provide additional funding to private and public entities for installing qualified renewable technologies. A renewable energy source can greatly reduce a building's operating expenses while producing clean environmentally friendly energy.

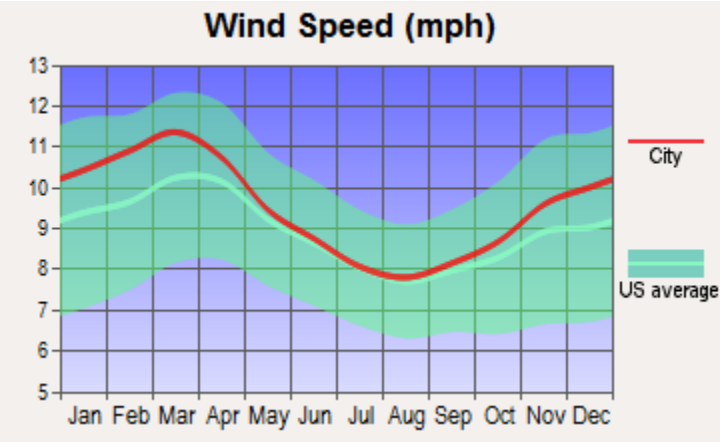
Solar Generation

The Unitarian Universalist Church at Washington Crossing installed a 9.1 kW grid-tied solar array on the roof of the 1975 building. Investments in new solar panels for this facility are not recommended due to the existing solar panels utilizing all the viable areas for additional panels and normally does not use the generating capacity of the existing solar system.

Wind Generation

Concord conducted a review of the applicability of wind energy for the Church. Wind energy production is another option available as a clean renewable energy generating source. Wind turbines of various types can be utilized to produce clean energy on a per building basis. Cash incentives are available per kWh of electric generated. Concord investigated the potential for smaller building mountable wind turbines, and horizontal turbines to maximize the available free space. In order to be economically viable a site requires a minimum average wind speed of 6 meters per second (13.5 mph). Based on the obtained wind data shown in **Figure 4** for Trenton, NJ the annual average wind speed is 10 mph with a peak of 11.2 mph, making this area unattractive for wind development. Therefore, wind energy is not a viable option to implement.

Figure 4: Monthly Wind Speed
(Ewing, New Jersey)



IX. ENERGY PURCHASING AND PROCUREMENT STRATEGY

Load Profile:

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

Electricity:

The electricity usage profile demonstrates a heating season dominated load profile. The average summer (May-September) consumption is 10% less than the average winter (October-April) consumption. The following table outlines the seasonal average monthly consumption and demand for the facility.

ELECTRIC UTILITY SEASONAL LOAD PROFILE				
FACILITY	**SEASONAL AVERAGES**			
	WINTER (OCT - APR)		**SUMMER (MAY - SEP)**	
DESCRIPTION	**KWH PER MONTH**	**KW PER MONTH**	**KWH PER MONTH**	**KW PER MONTH**
Unitarian Universalist Church at Washington Crossing	4,377	20.14	3,925	33.90

The historical usage profile is favorable as typically summer commodity rates are higher due to increased demand on the grid. However this recent winter saw a spike in electric pricing during the winter months due to the cold conditions, which caused an overall increase in price.

Natural Gas:

The Natural Gas Usage Profile demonstrates a heating load dominated profile, with minimal consumption being contributed by domestic hot water. The average summer (May – September) consumption is 92% less than the average winter (October- April) consumption. The follow table outlines the seasonal average monthly consumption for the facility.

NATURAL GAS UTILITY SEASONAL LOAD PROFILE		
FACILITY	**SEASONAL AVERAGES**	
	WINTER (OCT - APR)	**SUMMER (MAY - SEP)**
DESCRIPTION	**THERM PER MONTH**	**THERM PER MONTH**
Unitarian Universalist Church at Washington Crossing	825	61

This load profile will yield less than favorable natural gas prices due to the heating dominated profile. Higher winter month consumption will yield higher pricing which will not be offset by the summer month consumption. Nymex commodity pricing is generally higher in the winter months of November – March and lower in the summer months of April – October.

Third Party Supplier (TPS) natural gas commodity contracts that offer a product structure to include a Fixed percentage savings product structure for 100% of the facilities **metered** natural gas requirements is recommended. Several natural gas third party suppliers are offering this product service for end users for a guaranteed savings strategy.

Tariff Analysis:

Electricity:

The facility receives electrical service from Public Service Electric & Gas (PSEG) on rate schedule GLP (General Lighting & Power Service). The facility has not contracted a Third Party Supplier (TPS) to provide electric commodity service.

Each year since 2002, the four New Jersey Electric Distribution Companies (EDCs) - Public Service Gas & Electric Company (PSE&G), Atlantic City Electric Company (ACE), Jersey Central Power & Light Company (JCP&L), and Rockland Electric Company (RECO) - have procured several billion dollars of electric supply to serve their Basic Generation Service (BGS) customers through a statewide auction process held in February.

BGS refers to the service of customers who are not served by a third party supplier or competitive retailer. This service is sometimes known as Standard Offer Service, Default Service, or Provider of Last Resort Service.

The Auction Process has consisted of two auctions that are held concurrently, one for larger customers on an hourly price plan (BGS-CIEP) and one for smaller commercial and residential customers on a fixed-price plan (BGS-FP). This facility's rate structure is based on the fixed-price plan (BGS-FP).

The utility will continue to be responsible for maintaining the existing network of wires, pipes and poles that make up the delivery system, which will serve all consumers, regardless of whom

they choose to purchase their electricity or natural gas from. PSEG's delivery service rate includes the following charges: Customer Service Charge, Distribution Charge (kWh and Demand), Societal Benefits Charge (SBC), and Securitization Transition Charge.

Natural Gas:

The facility receives Natural Gas through Elizabethtown Gas under the General Delivery - Heat Rate Service. The Church has not contracted with a Third Party Supplier, to provide natural gas commodity service. For natural gas supply service, the client has a choice to either use Elizabethtown Gas's default service rate BGSS or contract with a Third Party Supplier (TPS) to supply natural gas commodity service.

Elizabethtown Gas provides basic gas supply service (BGSS) to customers who choose not to shop from a Third Party Supplier (TPS) for natural gas commodity. The option is essential to protect the reliability of service to consumers as well as protecting consumers if a third party supplier defaults or fails to provide commodity service.

Electric and Natural Gas Commodities Market Overview:

Current electricity and natural gas market pricing has remained relatively stable over the last couple of years. Commodity pricing in 2008 marked historical highs in both natural gas and electricity commodity. Commodity pricing commencing spring of 2009 continuing through 2013, has decreased dramatically over 2008 historic highs and continues to be favorable for locking in long term (2-5 year) contracts with 3rd Party Supplier's for both natural gas and electricity supply requirements.

It is important to note that both natural gas and electric commodity market prices are moved by supply and demand, political conditions, market technical and trader sentiment. This market is continuously changing. Energy commodity pricing is also correlated to weather forecasts. Because weather forecasts are dependable only in the short-term, prolonged temperature extremes can really cause extreme price swings.

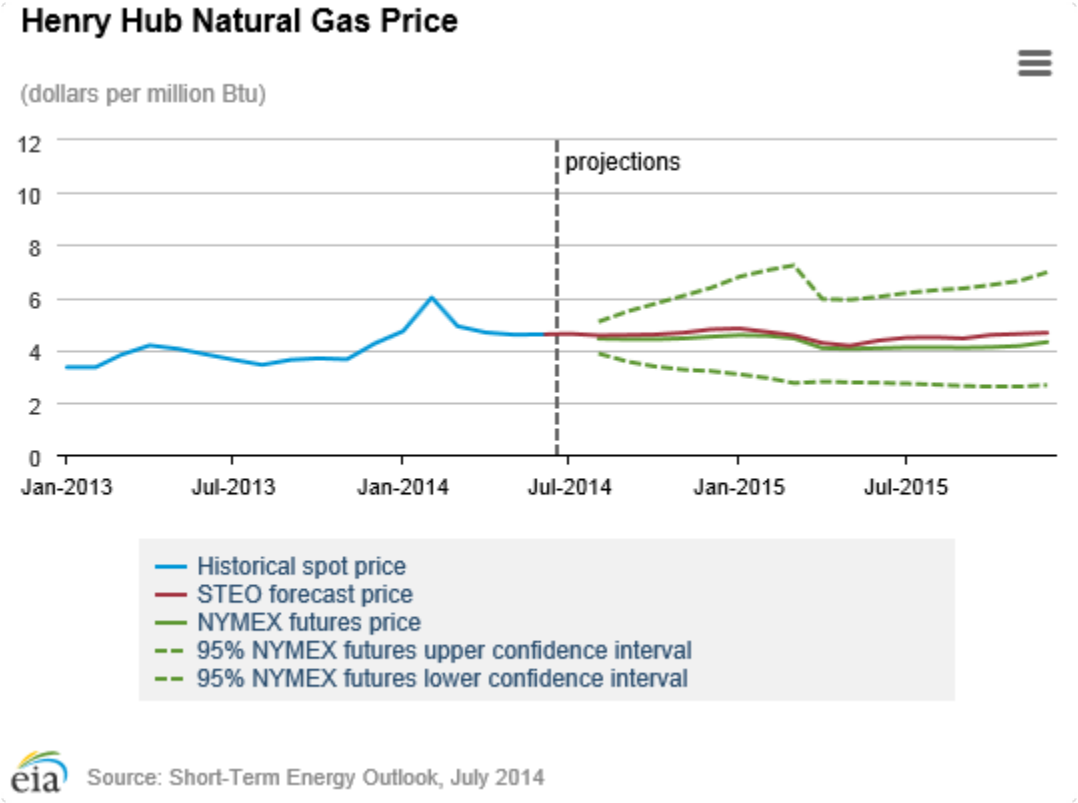
Short Term Energy Outlook - US Energy Information Administration (August 6, 2013):

Natural Gas

While this year's natural gas injection season began slowly in April, injections into storage during May and June were very strong. According to preliminary data from EIA's Weekly Natural Gas Storage Report, net injections were 100 billion cubic feet (Bcf) or greater for each of the past eight weeks. Over the previous four years, weekly injections during May and June exceeded 100 Bcf on only three occasions. EIA expects injections will slow during July and August as more natural gas goes to the electric power sector to meet air conditioning demand. The strength in storage injections is the result of strong production growth and moderate demand. Marketed production in April set a record high, at 73.5 Bcf/d, according to EIA's most recent data, with the largest increases coming from areas in Texas.

Natural gas spot prices averaged $4.59/MMBtu at the Henry Hub in June. EIA expects spot prices will remain near current levels until the start of the next winter heating season. Projected Henry Hub natural gas prices average $4.77/MMBtu in 2014 and $4.50/MMBtu in 2015.

Natural gas futures prices for October 2014 delivery (for the five-day period ending July 2) averaged $4.40/MMBtu. Current options and futures prices imply that market participants place the lower and upper bounds for the 95% confidence interval for October 2014 contracts at $3.37/MMBtu and $5.76/MMBtu, respectively. At this time last year, the natural gas futures contract for October 2013 averaged $3.62/MMBtu and the corresponding lower and upper limits of the 95% confidence interval were $2.69/MMBtu and $4.88/MMBtu.

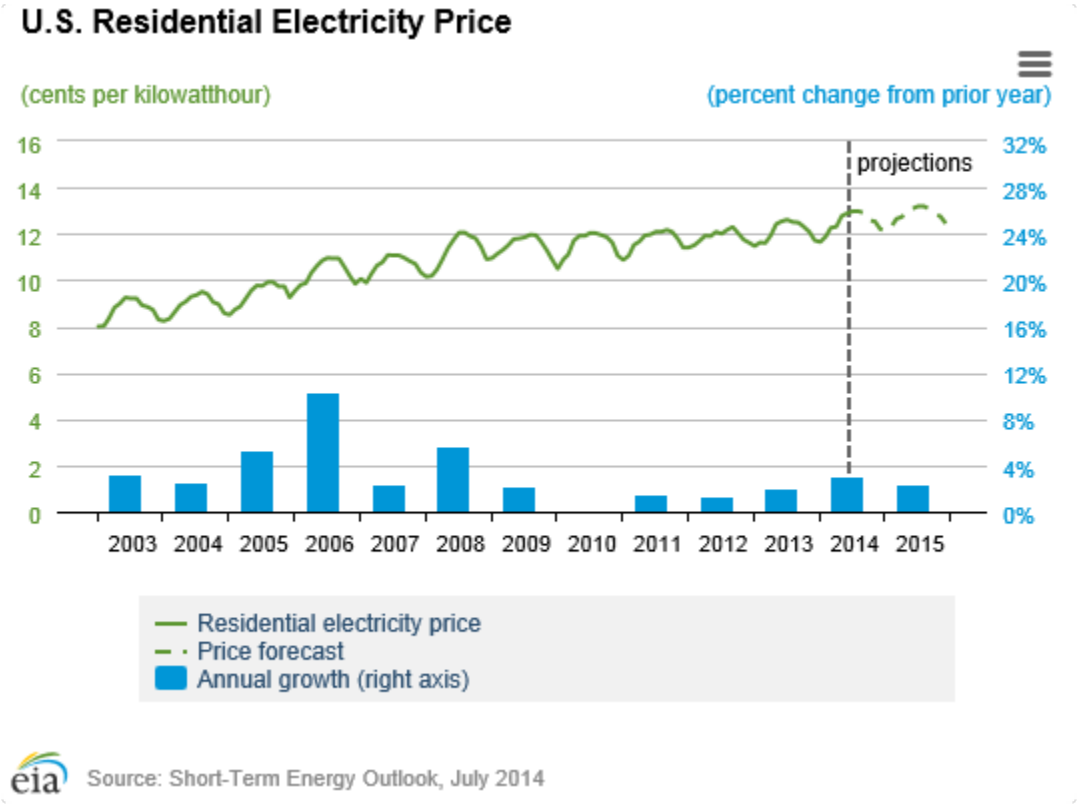


Electricity

EIA projects that total U.S. electricity generation in 2014 will grow by 1.6% from last year to an average of 11,300 gigawatthours per day. Recently rising costs for natural gas have driven power generators to use relatively more coal for supplying electricity. During the first half of 2014, EIA estimates that 40.0% of total generation was fueled by coal, compared with 39.0% during the first half of last year. In contrast, the share of generation supplied by natural gas fell from 26.1% last year to 24.8% during the first half of 2014. EIA expects that coal's share of generation will fall to an average of 38.8% in 2015 while the natural gas fuel share rises to 27.5%.

EIA expects the U.S. residential annual average electricity price to increase by 3.1% this year, which would be the highest growth rate since 2008, primarily in response to higher fuel costs for

power generation. The largest price increases occur in the Northeast region. Projected residential prices increase by an additional 2.4% during 2015.



The below recommendations presented by Concord Engineering are based on current information provided by the Church for their facility's historical energy usage. Any savings presented with these recommendations are estimates only based on that information. It is recommended that further analysis and review of more recent utility data and actual TPS electricity and natural gas supply contracts and historical billings be performed prior to performing any of the presented recommendations.

Recommendations:

1. Concord recommends that the Church investigate Third Party Commodity Supply procurement strategies for the purchase of electricity and natural gas.

2. After review of the utility consumption report and current commodity pricing outlook, Concord recommends that the Church utilize the advisement of a 3rd party unbiased Energy Consulting Firm licensed by the State of New Jersey Board of Public Utilities that is experienced in the procurement of commodities, New Jersey procurement laws, aggregation of facilities and energy supply risk and commodity management. This firm should be able to provide full service advisement over the term of the contract, provide market watch opportunities and identify any additional opportunities that may further

reduce costs. Many of these opportunities may include: energy rates; utility bill auditing; energy data analytics; and efficiency improvements.

It is important that a rational, defensible strategy for purchasing commodity in volatile markets is incorporated. Examples include:

- Budgets that reflect sound market intelligence
- An understanding of utility and market historical prices and trends
- Awareness of seasonal opportunities (e.g. shoulder months)
- Negotiation of fair contractual terms
- An aggressive, market based price

3. Concord also recommends that the Church consider utilizing a third party utility billing-auditing service to further analyze historical utility invoices such as water, sewer, natural gas, electricity and solar for incorrect billings and rate tariff optimization services. This service can be based on a shared savings model with no direct cost. The service could provide refunds on potential incorrect billings that may have been passed through by the utilities and paid by the Church.

X. INSTALLATION FUNDING OPTIONS

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

A. Incentive Programs:

Pay For Performance

The New Jersey Smart Start Pay for Performance program includes incentives based on savings resulted from implemented ECMs. The program is available for all buildings that were audited as part of the NJ Clean Energy's Local Government Energy Audit Program. The facility's participation in the program is assisted by an approved program partner. An "Energy Reduction Plan" is created with the facility and approved partner to shown at least 15% reduction in the building's current energy use. Multiple energy conservation measures implemented together are applicable toward the total savings of at least 15%. No more than 50% of the total energy savings can result from lighting upgrades / changes.

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

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

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

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

Direct Install Program

The New Jersey Clean Energy's Direct Install Program is a state funded program that targets small commercial and industrial facilities with peak demand of less than 200 kW. This turnkey program is aimed at providing owners a seamless, comprehensive process for analysis, equipment replacement and financial incentives to reduce consumption, lower utility costs and improve profitability. The program covers up to 70% of the cost for eligible upgrades including lighting, lighting controls, refrigeration, HVAC, motors, variable speed drives, natural gas and food service. Participating contractors (refer to www.njcleanenergy.com) conduct energy assessments in addition to your standard local government energy audit and install the cost-effective measures. The church has already utilized the Direct Install program for their facility prior to the audit.

Smart Start Program

Prescriptive Measures - The New Jersey Clean Energy's Smart Start prescriptive measures incentives include unit pricing incentives for installation of energy efficient equipment and controls. Proposed equipment and controls must meet the minimum efficiency requirements as well as other application requirements. The Smart Start prescriptive incentives applicable for new construction, renovations, remodeling and equipment replacements, for a wide range of equipment including:

- Electric Chillers
- Gas Cooling
- Electric Unitary HVAC
- Ground Source Heat Pumps
- Gas Heating
- Variable Frequency Drives
- Gas Water Heating
- Premium Motors
- Prescriptive Lighting
- Lighting Controls
- Technical Studies

Custom Measures - The New Jersey Clean Energy's Smart Start prescriptive measures incentives include all measures not identified in the prescriptive measures category or measures that must have savings verified through additional analysis such as energy model simulations. Custom measures are intended to include savings as a result of unique energy efficiency measures, which are typically facility specific such as waste heat recovery. Custom incentives are provided based on the amount of energy saved and minimum internal rate of return in order to be eligible.

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

B. Financing Options:

On-Bill Financing

On-bill financing allows a loan for energy efficiency measures to be repaid over time via an additional line item on the recipient's utility bill, which decreases repayment risk for the lender. The lender in "classic" utility on-bill financing has traditionally been the utility itself. Hybrid models have also emerged in which public and private funds are pooled to offer low-interest loans, with repayment similarly attached to the utility bill. The utility then collects the payment and returns it to the lender, which lowers the lender's administrative costs. The utility customer benefits from lower energy costs after retrofits, and typically pays loans back over a period of about 2–5 years. This model has also recently become available with Third Party Commodity Suppliers allowing for energy efficiency project funding to be rolled into their bill for the customer. If the owner is interested in this funding mechanism they should contact their local utility or third party supplier if any such program is offered. Alternatively if the owner's current third party supply contract is expiring this could be included as an option when bidding for new suppliers.

Lease to Own (Leaseback)

A lease to own arrangement is where the seller of an asset (i.e. building, equipment, etc.) leases back the same asset from the purchaser. In a leaseback arrangement, the specifics of the arrangement are made immediately after the sale of the asset, with the amount of the payments and the time period specified. Essentially, the seller of the asset becomes the lessee and the purchaser becomes the lessor in this arrangement. A leaseback arrangement is useful when entities need to un-tie the cash invested in an asset for other investments, but the asset is still needed in order to operate. Leaseback deals can also provide the seller with additional tax deductions. The lessor benefits in that they will receive stable payments for a specified period of time.

Power Purchase Agreement

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

Conventional Financing

This optional involves taking a conventional approach to borrowing money from a lending institution for an agreed upon term at a negotiated or stipulated interest rate. The term of financing and rates can vary greatly base on institution and credit rating of the borrower.

XI. ADDITIONAL RECOMMENDATIONS

In addition to the ECMs and REMs, there are maintenance and operational measures that can provide significant energy savings and provide immediate benefit, many of which facility's staff are already performing. Maintenance items and small operational improvements are typically achievable with on-site staff or maintenance contractors and in turn have the potential to provide substantial operational savings compared to the costs associated. The following are recommendations which should be considered a priority in achieving an energy efficient building

A. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.

B. Maintain all weather stripping on windows and doors.

C. Clean all light fixtures to maximize light output.

D. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.

E. Confirm that outside air economizers on the air handling units are functioning properly to take advantage of free cooling and avoid excess outside air during occupied periods.

F. Perform annual steam trap surveys to minimize energy waste caused by failed traps, and to maintain an inventory of system equipment.

G. Verify all HVAC control systems are utilizing setback and scheduling capabilities.

H. Shutdown all non-essential equipment during unoccupied periods.

XII. ENERGY AUDIT ASSUMPTIONS

The assumptions utilized in this energy audit include but are not limited to following:

A. Cost Estimates noted within this report are based on industry accepted costing data such as RS Means™ Cost Data, contractor pricing and engineering estimates. All cost estimates for this level of auditing are +/- 20%. Prevailing wage rates for the specified region has been utilized to calculate installation costs. The cost estimates indicated within this audit should be utilized by the owner for prioritizing further project development post the energy audit. Project development would include investment grade auditing and detailed engineering.
B. Energy savings noted within this audit are calculated utilizing industry standard procedures and accepted engineering assumptions. For this level of auditing, energy savings are not guaranteed.
C. Information gathering for each facility is strongly based on interviews with operations personnel. Information dependent on verbal feedback is used for calculation assumptions including but not limited to the following:
    a. operating hours
    b. equipment type
    c. control strategies
    d. scheduling
D. Information contained within the major equipment list is based on the existing owner documentation where available (drawings, O&M manuals, etc.). If existing owner documentation is not available, catalog information is utilized to populate the required information.
E. Equipment incentives and energy credits are based on current pricing and status of rebate programs. Rebate availability is dependent on the individual program funding and applicability.
F. Equipment (HVAC, Plumbing, Electrical, & Lighting) noted within an ECM recommendation is strictly noted as a **basis for calculation** of energy savings. The owner should use this equipment information as a benchmark when pursuing further investment grade project development and detailed engineering for specific energy conservation measures.
G. Utility bill annual averages are utilized for calculation of all energy costs unless otherwise noted. Accuracy of the utility energy usage and costs are based on the information provided. Utility information including usage and costs is estimated where incomplete data is provided.
H. Greenhouse Gas Emissions are calculated for each ECM, the basis for these emissions reductions are NJCEP published standard emissions factors, which are the following:.
    a. Electric Savings:
        1. CO_2: 1.52 lbs/kWh
        2. NO_X: 0.0028 lbs/kWh
        3. SO_2: 0.0065 lbs/kWh
    b. Natural Gas Savings:
        1. CO_2: 11.7 lbs/therm
        2. NO_X: 0.0092 lbs/therm

APPENDIX A

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Unitarian Universalist Church at Washington Crossing

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY

ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM #1	Lighting Upgrade - General	$14,090	$7,130	$5,600	$15,620	$388	$0	$388	15	$5,820	$0	-62.7%	40.3	-10.39%	($10,988.08)
ECM #2	Lighting Upgrade - Exterior	$4,270	$966	$300	$4,936	$141	$0	$141	15	$2,115	$0	-57.2%	35.0	-9.11%	($3,253.00)
ECM #3	De-stratification Fans	$4,800	$2,100	$0	$6,900	$185	$0	$185	15	$2,775	$0	-59.8%	37.3	-9.69%	($4,691.48)
ECM #4	Domestic Hot Water Heater Upgrade	$4,400	$2,100	$240	$6,260	$23	$0	$23	15	$345	$0	-94.5%	272.2	-24.50%	($5,985.43)
ECM #5	Weatherization	$100	$100	$0	$200	$34	$0	$34	10	$340	$0	70.0%	5.9	11.03%	$90.03
ECM #6	Window Upgrades	$7,000	$3,000	$0	$10,000	$277	$0	$277	15	$4,155	$0	-58.5%	36.1	-9.39%	($6,693.19)
ECM #7	Water Conservation	$140	$70	$0	$210	$283	$0	$283	10	$2,830	$0	1247.6%	0.7	134.74%	$2,204.05
ECM #8	Air Balance Rooms 201,202,203 and Re-calibrate Thermostat	$2,000	$500	$0	$2,500	$22	$0	$22	15	$330	$0	-86.8%	113.6	-18.68%	($2,237.37)

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

APPENDIX B

Concord Engineering Group, Inc.

520 BURNT MILL ROAD
VOORHEES, NEW JERSEY 08043
PHONE: (856) 427-0200
FAX: (856) 427-6508

SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives from July 1, 2013 to June 30, 2014:

Electric Chillers

Water-Cooled Chillers	$16 - $170 per ton
Air-Cooled Chillers	$8 - $52 per ton

Energy Efficiency must comply with ASHRAE 90.1-2007

Gas Cooling

Gas Absorption Chillers	$185 - $450 per ton
Gas Engine-Driven Chillers	Calculated through custom measure path)

Desiccant Systems

$1.00 per cfm – gas or electric

Electric Unitary HVAC

Unitary AC and Split Systems	$73 - $92 per ton
Air-to-Air Heat Pumps	$73 - $92 per ton
Water-Source Heat Pumps	$81 per ton
Packaged Terminal AC & HP	$65 per ton
Central DX AC Systems	$40- $72 per ton
Dual Enthalpy Economizer Controls	$250
Occupancy Controlled Thermostat (Hospitality & Institutional Facility)	$75 per thermostat
A/C Economizing Controls	≤ 5 tons $85/unit; >5 tons $170/unit

Energy Efficiency must comply with ASHRAE 90.1-2007

Gas Heating

Gas Fired Boilers < 300 MBH	$2.00 per MBH, but not less than $300 per unit
Gas Fired Boilers ≥ 300 - 1500 MBH	$1.75 per MBH
Gas Fired Boilers ≥1500 - ≤ 4000 MBH	$1.00 per MBH
Gas Fired Boilers > 4000 MBH	(Calculated through Custom Measure Path)
Gas Furnaces	$400 per unit, AFUE ≥ 95%
Boiler Economizing Controls	$1,200 - $2,700
Low Intensity Infrared Heating	$300 - $500 per unit

Ground Source Heat Pumps

Closed Loop	$450 per ton, EER ≥ 16 $600 per ton, EER ≥ 18 $750 per ton, EER ≥ 20

Energy Efficiency must comply with ASHRAE 90.1-2007

Variable Frequency Drives

Variable Air Volume	$65 - $155 per hp
Chilled-Water Pumps ≥ 20 hp	$60 per VFD rated hp
Rotary Screw Air Compressors ≥ 25 hp	$5,250 to $12,500 per drive
Cooling Towers ≥ 10 hp	$60 per VFD rated hp
Boiler Fans ≥ 5 HP	$65 to $155 per hp
Boiler Feed Water Pumps ≥ 5 HP	$60 to $155 per hp
Commercial Kitchen Hood up to 50 HP	Retrofit $55 – $300 per hp New Hood $55 - $250 per hp

Natural Gas Water Heating

Gas Water Heaters ≤ 50 gallons, 0.67 energy factor or better	$50 per unit
Gas-Fired Water Heaters > 50 gallons	$1.00 - $2.00 per MBH
Gas-Fired Booster Water Heaters	$17 - $35 per MBH
Gas Fired Tankless Water Heaters	$300 per unit

Prescriptive Lighting

T-8 reduced Wattage (28w/25w 4', 1-4 lamps) Lamp & ballast replacement	$10 per fixture
For retrofit of T-8 fixtures by permanent de-lamping & new reflectors (Electronic ballast replacement required)	$15 per fixture
T-5 and T-8 High Bay Fixtures	$16 - $200 per fixture
Metal Halide w/Pulse Start Including Parking Lot (For fixtures ≥ 150w)	$25 per fixture
HID ≥ 100w Replace with new induction fixture. (must be 30% less watts/fixture than HID system)	$70 per fixture
HID ≥ 100w Retrofit with induction lamp, power coupler and generator (must be 30% less watts/fixture than HID system)	$50 per fixture

Prescriptive Lighting - LED

LED Display Case Lighting	$30 per display case
LED Shelf-Mtd. Display & Task Lights	$15 per linear foot
LED Portable Desk Lamp	$20 per fixture
LED Wall-wash Lights	$30 per fixture
LED Recessed Down Lights	$35 per fixture
LED Outdoor Pole/Arm-Mounted Area and Roadway Luminaries	$175 per fixture
LED Outdoor Pole/Arm-Mounted Decorative Luminaries	$175 per fixture
LED Outdoor Wall-Mounted Area Luminaries	$100 per fixture
LED Parking Garage Luminaries	$100 per fixture
LED Track or Mono-Point Directional Lighting Fixtures	$50 per fixture
LED High-Bay and Low-Bay Fixtures for Commercial & Industrial Bldgs.	$150 per fixture
LED High-Bay-Aisle Lighting	$150 per fixture
LED Stairwell and Passageway Luminaires	$40 per fixture
LED Bollard Fixtures	$50 per fixture
Luminaires for Ambient Lighting of Interior Commercial Spaces (1x4, 2x2, 2x4)	$50 per fixture
LED Fuel Pump Canopy	$100 per fixture
LED Screw-based & Pin-based (PAR, MR, BR, R) Standards (A-Style) and Decorative Lamps	$10 per lamp for R/PAR20,MR/PAR16,Globe,Candelabra or Misc $20 per lamp for R/BR/PAR 30, R/BR/PAR 38-40, A-Lamp
LED Refrigerator/Freezer case lighting replacement of fluorescent in medium and low temperature display case	$30 per 4 foot $42 per 5 foot $65 per 6 foot
LED Retrofit Kits	To be evaluated through the customer measure path

Lighting Controls – Occupancy Sensors

Wall Mounted (Existing Facilities Only)	$20 per control
Remote Mounted (Existing Facilities Only)	$35 per control
Daylight Dimming Controls	$45 per fixture controlled
Occupancy Based hi-low Dimming Control	$35 per fixture controlled
Occupancy Sensor Remote Mounted	$35 per control

Refrigeration Doors/Covers

Energy-Efficient Doors/Covers for Installation on Open Refrigerated Cases	$100 per door
Aluminum Night Curtains for Installation on Open Refrigerated Cases	$3.50 per linear foot

Refrigeration Controls

Door Heater Controls	$50 per control
Electric Defrost Controls	$50 per control
Evaporator Fan Controls	$75 per control
Novelty Cooler Shutoff	$50 per control

Other Equipment Incentives

Performance Lighting	$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1-2007 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive
Custom Measures	$0.16 KWh and $1.60/Therm of 1st year savings, or a buy down to a 1 year payback on estimated savings. Minimum required savings of 75,000 KWh or 1,500 Therms and an IRR of at least 10%.

APPENDIX C

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Unitarian Universalist Church at Washington Crossing

Primary Property Function: Worship Facility
Gross Floor Area (ft²): 11,863
Built: 1975

For Year Ending: April 30, 2014
Date Generated: July 31, 2014

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
Unitarian Universalist Church at Washington Crossing
268 Washington Crossing-Pennington Road
Titusville, New Jersey 08560

Property Owner
Unitarian Universalist Church at Washington Crossing
268 Washington Crossing-Pennington Road
Titusville, NJ 08560
(____)____-_____

Primary Contact
Leslie McGeorge
268 Washington Crossing-Pennington Road
Titusville, NJ 08560
215-287-3388
ljmcgeorge@gmail.com

Property ID: 4114250

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
66.2 kBtu/ft²

Source EUI
94.7 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	608,030 (77%)
Electric - Grid (kBtu)	143,778 (18%)
Electric - Solar (kBtu)	33,769 (4%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	75.7
National Median Source EUI (kBtu/ft²)	108.3
% Diff from National Median Source EUI	-13%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/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 D

MAJOR EQUIPMENT LIST

Concord Engineering Group

Unitarian Universalist Church

Domestic Water Heaters

Tag	DHW-1	DHW-2
Unit Type	Automatic Storage Water Heater	Automatic Storage Water Heater
Qty	1	1
Location	Basement Mechanical Rm	Basement Mechanical Rm
Area Served	Entire Facility	Entire Facility
Manufacturer	State Industries	State Industries
Model #	SR8 40 NQVT0	GS640YBVIT
Serial #	F94679894	1144A012114
Size (Gallons)	40	40
Input Capacity (MBH/KW)	50 MBH	40 MBH
Recovery (Gal/Hr)	53 Gal/Hr	44 Gal/Hr
Efficiency %	80%	90%
Fuel	Gas-Fired	Gas-Fired
Approx Age	20	3
ASHRAE Service Life	12	12
Remaining Life	-8	9
Comments		Electronic Gas Controls with Power Vent Blower

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Unitarian Universalist Church

Rooftop Units

Tag	RTU-1	RTU-2
Unit Type	Packaged Rooftop Gas/Electric	Packaged Rooftop Gas/Electric
Qty	1	1
Location	Roof	Roof
Area Served	Classrooms	Classrooms
Manufacturer	York	York
Model #	ZJ049N09B2AAA6A	ZJ049N09B2AAA6A
Serial #	N1K3077516	N1K3077515
Cooling Type	DX Coil	DX Coil
Cooling (Tons)	4-Tons	4-Tons
Cooling Efficiency (EER/SEER)	11.8 EER	11.8 EER
Heating Type	Natural Gas	Natural Gas
Heating (MBH)	120	120
Heating Efficiency	80%	80%
Evaporator Fan (HP)	1 1/2	1 1/2
Condenser Fan (HP)	1/3	1/3
Approx Age	1	1
ASHRAE Service Life	15	15
Remaining Life	14	14
Comments	Intellidyne Controllers for the Economizers	Intellidyne Controllers for the Economizers

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

RTU-3	RTU-4	RTU-5
Packaged Rooftop Gas/Electric	Packaged Rooftop Gas/Electric	Packaged Rooftop Gas/Electric
1	1	1
Roof	Roof	Roof
Meeting Room	Chapel	Lobby Entrance
York	York	York
ZJ090N15P2FAA5A	ZJ240N32P2FAA2A	ZJ037N07B2AAA5A
N1K3077482	N1K3077992	N1K3077513
DX Coil	DX Coil	DX Coil
7.5-Tons	20-Tons	3-Tons
12.2 EER	11.6 EER	11.8 EER
Natural Gas	Natural Gas	Natural Gas
180	400	80
80%	80%	80%
2 Fans Each at 0.75	4 Fans Each at 1/3	1 1/2
3	7.5	1/3
1	1	1
15	15	15
14	14	14
Intellidyne Controllers for the Economizers	Intellidyne Controllers for the Economizers	Intellidyne Controllers for the Economizers

MAJOR EQUIPMENT LIST

Concord Engineering Group

Unitarian Universalist Church

Split AC Units

Tag	CU-1	AHU-1
Unit Type	Split Air-Cooled Condenser	Split Air Handling Unit
Qty	1	1
Location	Roof	Basement Mechanical Rm
Area Served	Admin Offices, Restrooms & Nursery	Admin Offices, Restrooms & Nursery
Manufacturer	York	York
Model #	YCJF36S41S1A	TM9X080C16MP11B
Serial #	W1G3944652	W1G3900696
Heating Type	N/A	Gas-Fired
Heating Capacity (BTUH)	N/A	80,000
Cooling Type	DX Coil	DX Coil
Cooling Capacity (BTUH)	3-Tons	3-Tons
Cooling/Heating Efficiency	14.5 SEER	95.5% AFUE
Condenser/SA Fan (HP)	1/4	1/2
Electrical (V/H/P)	230 V/60Hz /1-Phase	230 V/60Hz /1-Phase
Approx Age	1	1
ASHRAE Service Life	15	15
Remaining Life	14	14
Comments		Intellidyne Controller for the Forced-Air Heating

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Unitarian Universalist Church

Kitchen

Tag			
Unit Type	Dishwasher	Gas Oven/Griddle	
Qty	1	2	
Location	Kitchen	Kitchen	
Manufacturer	American Dish Service	Hobart	
Model #	AF-3D	No Tag	
Serial #	29103	No Tag	
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

APPENDIX E

CEG Project #: 1C14086
Facility Name: Unitarian Universalist Church
Address: 268 Washington Crossing-Pennington Road
City, State, Zip Titusville, NJ 08560

			EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT							RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS					
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $
1	Church	600	Remote Phosphur LED A23 - 32W LED Pendant	1	32	16	0.51	307	Existing to Remain	No Changes	1	32	0	0.51	307	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
16	Church	600	Track Light Par38 120w Flood	1	120	5	0.60	360	Replace Lamp	19.5w Dimmable Par38 LED	1	19.5	5	0.10	59	0.50	302	$52	0	No New Controls	0	0.0%	0	$0
17	Church	600	Track Light Par38 23w CFL Flood	1	23	3	0.07	41	Existing to Remain	No Changes	1	23	0	0.07	41	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
2	Storage	400	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	1	0.06	25	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	1	0.05	19	0.01	6	$1	0	No New Controls	0	0.0%	0	$0
2	Music Director Office	3000	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	2	0.12	372	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	2	0.10	288	0.03	84	$14	0	No New Controls	0	0.0%	0	$0
5	Lobby	1000	26W CFL Recess Wall Washer	1	26	3	0.08	78	Replace Lamp	Philips A19 LED Lamp 8w	1	8	3	0.02	24	0.05	54	$9	0	No New Controls	0	0.0%	0	$0
1	Lobby	1000	Remote Phosphur LED A23 - 32W LED Pendant	1	32	3	0.10	96	Existing to Remain	No Changes	1	32	0	0.10	96	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
2	Lobby	1000	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	1	0.06	62	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	1	0.05	48	0.01	14	$2	0	No New Controls	0	0.0%	0	$0
2	Restroom	2600	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	3	0.19	484	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	3	0.14	374	0.04	109	$19	0	No New Controls	0	0.0%	0	$0
2	Restroom	2600	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	3	0.19	484	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	3	0.14	374	0.04	109	$19	0	No New Controls	0	0.0%	0	$0
2	Nursery	1000	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	4	0.25	248	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	4	0.19	192	0.06	56	$10	0	No New Controls	0	0.0%	0	$0
2	Office	3000	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	4	0.25	744	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	4	0.19	576	0.06	168	$29	0	No New Controls	0	0.0%	0	$0
2	Office	3000	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	1	0.06	186	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	1	0.05	144	0.01	42	$7	0	No New Controls	0	0.0%	0	$0
2	Office	3000	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	4	0.25	744	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	4	0.19	576	0.06	168	$29	0	No New Controls	0	0.0%	0	$0
2	Hallway	1000	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	2	0.12	124	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	2	0.10	96	0.03	28	$5	0	No New Controls	0	0.0%	0	$0
1	Storage	400	Remote Phosphur LED A23 - 32W LED Pendant	1	32	1	0.03	13	Existing to Remain	No Changes	1	32	0	0.03	13	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
2	Janitor's Closet 212	400	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	1	0.06	25	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	1	0.05	19	0.01	6	$1	0	No New Controls	0	0.0%	0	$0
2	Hallway	1000	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	2	0.12	124	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	2	0.10	96	0.03	28	$5	0	No New Controls	0	0.0%	0	$0
2	File Storage 211	400	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	1	0.06	25	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	1	0.05	19	0.01	6	$1	0	No New Controls	0	0.0%	0	$0
2	Storage	400	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	1	0.06	25	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	1	0.05	19	0.01	6	$1	0	No New Controls	0	0.0%	0	$0

			EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT							RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS					
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $
6	Classroom 201	1000	Recess LED Dimmable Downlight 12W	1	12	8	0.10	96	Existing to Remain	No Changes	1	12	0	0.10	96	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
7	Classroom 201	1000	LED Track Light MR-16 5W	1	5	3	0.02	15	Existing to Remain	No Changes	1	5	0	0.02	15	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
2	Classroom 202	1000	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	7	0.43	434	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	7	0.34	336	0.10	98	$17	0	No New Controls	0	0.0%	0	$0
2	Classroom 203	1000	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	8	0.50	496	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	8	0.38	384	0.11	112	$19	0	No New Controls	0	0.0%	0	$0
8	Exit Signs	8760	LED Exit Signs	1	3	11	0.03	289	Existing to Remain	No Changes	1	3	0	0.03	289	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
2	Classroom 108	1000	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	8	0.50	496	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	8	0.38	384	0.11	112	$19	0	No New Controls	0	0.0%	0	$0
2	Classroom 109	1000	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	7	0.43	434	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	7	0.34	336	0.10	98	$17	0	No New Controls	0	0.0%	0	$0
2	Classroom 111	1000	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	8	0.50	496	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	8	0.38	384	0.11	112	$19	0	No New Controls	0	0.0%	0	$0
2	Auditorium 113	600	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	12	0.74	446	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	12	0.58	346	0.17	101	$17	0	No New Controls	0	0.0%	0	$0
2	Basement Hall	1000	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	5	0.31	310	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	5	0.24	240	0.07	70	$12	0	No New Controls	0	0.0%	0	$0
2	Storage 102	400	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	1	0.06	25	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	1	0.05	19	0.01	6	$1	0	No New Controls	0	0.0%	0	$0
2	Storage 118	400	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	1	0.06	25	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	1	0.05	19	0.01	6	$1	0	No New Controls	0	0.0%	0	$0
2	Storage 114	400	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	1	0.06	25	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	1	0.05	19	0.01	6	$1	0	No New Controls	0	0.0%	0	$0
2	Stairs	1000	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	4	0.25	248	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	4	0.19	192	0.06	56	$10	0	No New Controls	0	0.0%	0	$0
2	Kitchen	900	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	7	0.43	391	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	7	0.34	302	0.10	88	$15	0	No New Controls	0	0.0%	0	$0
2	Restroom 104	800	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	2	0.12	99	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	2	0.10	77	0.03	22	$4	0	No New Controls	0	0.0%	0	$0
2	Restroom 105	800	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	2	0.12	99	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	2	0.10	77	0.03	22	$4	0	No New Controls	0	0.0%	0	$0
2	Hallway 102	1000	2-Lamp T8 4' 32W Surface Mount Prismatic	2	62	1	0.06	62	Replace Fixture	1x4 Surface LED 4100 lumen 48w Cooper #4WNLED-LD1-41-F-UNV-L840-CD1-U	1	48	1	0.05	48	0.01	14	$2	0	No New Controls	0	0.0%	0	$0
9	Mechanical Room	1000	23W CFL	1	23	1	0.02	23	Replace Lamp	Philips A19 LED Lamp 8w	1	8	1	0.01	8	0.02	15	$3	0	No New Controls	0	0.0%	0	$0
10	Auditorium 113	600	42W CFL	1	42	7	0.29	176	Replace Lamp	A19 LED Lamp 15w	1	15	7	0.11	63	0.19	113	$19	0	No New Controls	0	0.0%	0	$0
11	Auditorium 113	600	23W CFL Wall Sconce	1	23	4	0.09	55	Replace Lamp	Philips A19 LED Lamp 8w	1	8	4	0.03	19	0.06	36	$6	0	No New Controls	0	0.0%	0	$0

			EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT							RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS					
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $
12	Kitchen	900	13W CFL	1	13	1	0.01	12	Existing to Remain	No Changes	1	13	0	0.01	12	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
14	Exterior	1000	23w CFL - BR40 Outdoor Light	1	23	6	0.14	138	Replace Lamp	17w BR40 LED	1	17	6	0.10	102	0.04	36	$6	0	No New Controls	0	0.0%	0	$0
13	Exterior	1000	60 watt A19 Incandescent	1	60	2	0.12	120	Replace Lamp	Philips A19 LED Lamp 8w	1	8	2	0.02	16	0.10	104	$18	0	No New Controls	0	0.0%	0	$0
15	Exterior	1000	20w CFL Screw-in Walkway Light	1	20	7	0.14	140	Replace Lamp	Philips A19 LED Lamp 8w	1	8	7	0.06	56	0.08	84	$14	0	No New Controls	0	0.0%	0	$0
18	Exterior	1000	175w Pole Lamp	1	208	7	1.46	1,456	Re-lamp & Bypass Ballast	Neptun LED Custom Retrofit Kit 120w	1	122	7	0.85	854	0.60	602	$103	0	No New Controls	0	0.0%	0	$0
	TOTAL					**192**	**10**	**11,172**					**146**	**7**	**8,075**	**3**	**3,097**	**$530**			**0**	**0**	**0**	**$0**

APPENDIX F

UNITARIAN UNIVERSALIST CHURCH AT WASHINGTON CROSSING
7/3/2014 -- Outside Air Temperature = 84 degrees F and 84% Humidity

Room	Location	Room Temperature Degrees F	Infrared Gun Reading Degrees F	Comments
Lobby	Front Double Doors	76	78	Taken at door seals
	Side Windows	76	78	Taken at side windows
	Rear Lobby Windows	76	79	Taken at windows
Multi-Purpose	Rear Exit Door	76	78	Taken at door seals
	Side Windows	76	79	Taken at side windows
Room 103	Exit Door	75	79	Taken at door seal
Room 102	Windows	70 in room	78	Taken at windows
		Thermostat Reads 74		**Room Needs to be Air Balanced**
				Thermostat Needs to be Calibrated
Rear Exit	Double Doors	76	79	At door seal
		76	80	At side windows
		76	78	Taken at window with drapes
Room 203	Windows	76	81	Taken at windows
Room 202	Windows	76	80	Taken at windows
Room 201	Exit Door	75	76	Taken at door seals
	Windows	75	77	Taken at side windows
Sanctuary	Windows	79 at thermostat	81	Taken at windows
			81	Taken at windows
			83	Taken at windows
			81	Taken at windows
			83	Taken at windows

APPENDIX G

ENERGY STAR® Portfolio Manager®

"How To" Series

Portfolio Manager® Quick Start Guide

EPA's ENERGY STAR Portfolio Manager tool helps you measure and track energy use, water use, and greenhouse gas emissions of your buildings, all in a secure online environment. You can use the results to identify under-performing buildings, set investment priorities, verify efficiency improvements, and receive EPA recognition for superior energy performance. Follow the steps in this guide to get started using the new Portfolio Manager to benchmark your properties, assess performance, and view results.

Getting Started

Step 1: *Add a Property*

Step 2: *Enter Energy & Water Data*

Step 3: *View Results & Progress*

1 Add a Property

To get started, log in to Portfolio Manager at www.energystar.gov/benchmark. Then, follow these instructions to create a property and to enter property information.

1. Click **Add a Property** on the **MyPortfolio** tab.
2. Answer questions about your property and click **Get Started!**
3. Enter basic property information and select the boxes next to the statements that apply to your property. Then click **Continue**.
4. Enter use details such as gross floor area, operating hours, and number of workers for each type of use. You can use default or temporary values at this time and enter more accurate data later. **NOTE:** Mouse over the use detail to see a definition.
5. Click **Add Property**. When you have successfully added your property, you will see the property's **Summary** tab.

Property Types

All property types can be benchmarked. For properties with multiple buildings only hospitals, hotels, K-12 schools, and senior care communities are eligible to receive the 1 – 100 ENERGY STAR score.

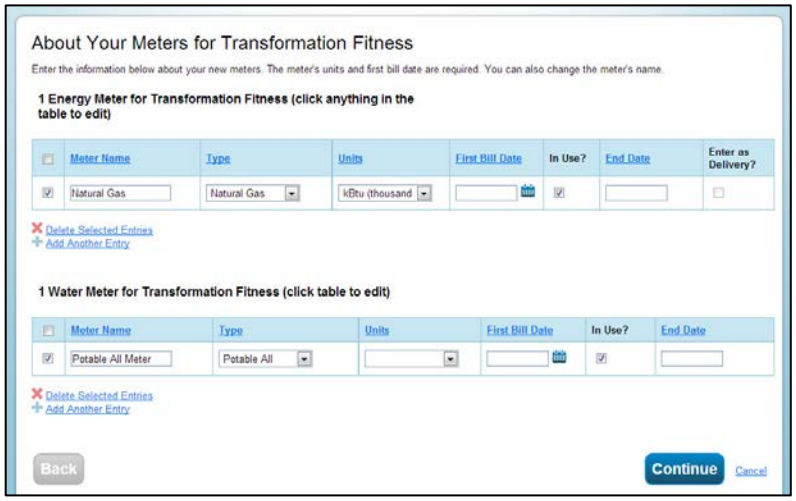
If you have additional types of uses on the property, you can add them at any time.

1. Click the property's **Details** tab, and then select a use type from the **Add Another Type of Use** drop-down menu. Click **Add**.
2. Enter use details for the property and then click **Save Use**.

Properties with Multiple Use Types

Some properties include multiple use types, such as restaurants in hotels, salons in senior care communities, and cafeterias in hospitals. As a general rule, if a certain use commonly occurs in the type of property being benchmarked, simply include it in the square footage of the building's primary use. You do not need to add another type of use.

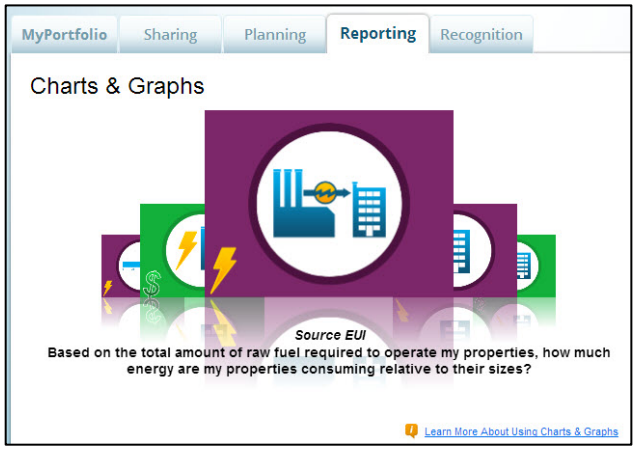
2 Enter Energy & Water Data



To receive an accurate picture of your building's performance, you need to tell Portfolio Manager how much and what kind of energy and water your building consumes. Follow these steps to enter energy and water data for your property.

1. Click on your property from the **MyPortfolio** tab and then select the **Meters** tab.
2. Click **Add Another Meter**.
3. Select the sources of your property's energy and your property's water usage, identify the number of meters, and then click **Get Started!**
4. Click on a meter to enter units and first bill date. If it is a bulk fuel purchase, select the **Enter as Delivery?** checkbox. Then click **Continue**.
5. Click the gray arrow next to each meter to expand the section on the **Your Meter Entries** page. Click **Add Another Entry** under the meter and enter data. Check **Estimation** if you are not including measured data for the entry.
6. Click **Finish Meter Set Up** when you have finished entering information for each meter.
7. Select the boxes of the meters that total your property's energy and water use on the **Meters to Add to Total Consumption** page. Click **Apply Selections**.

3 View Results & Progress



It is easy for you to see trends and to track improvement for your entire portfolio of buildings with a variety of standard graphs and reports in Portfolio Manager. Follow these steps to view reports about your properties and to assess progress.

- ✓ Click the **Reporting** tab to view graphs and reports for a property or portfolio.
- ✓ Click on the **Charts & Graphs** options to instantly see colorful graphs of how your portfolio or group of properties is performing. You can print graphs or download the images to incorporate into a presentation or document.
- ✓ View the **Templates & Reports** section to see a list of available standard reports, including Performance Highlights, Energy Performance, and Water Performance. Select **Generate New Report** from the **Action** drop-down menu to create a spreadsheet.

Learn More!

To learn more about Portfolio Manager, visit www.energystar.gov/benchmark.
To get answers to your questions, visit www.energystar.gov/buildingshelp.