Bristol Township Energy Assessment

Township Administration and Police Building
Township Pump Stations

2501 Bath Road, Bristol, PA 19007

Prepared By:

Practical Energy Solutions of West Chester, PA

Prepared For:

Bristol Township, as part of the Delaware Valley Regional Planning Commission's *Circuit Rider for Energy Efficiency* program

APRIL 2016

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

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Executive Summary

The Bristol Township Administration and Police building (32,160 ft^2) is a multi-use facility housing administrative offices, as well as the police department, a community meeting room, and a storage area. The storage area comprises approximately 25 percent of the building's square footage.

From September 2011 through August 2012, the township spent $40,054 on energy at this building, 76 percent of which was for electricity. The electric load is relatively high throughout the year due to 24/7 police department operations.

The building's energy use intensity (EUI)—a commonly-used measure for benchmarking whole-building energy performance—is 58 kBtu per square foot, notably lower than that of similar facilities in our region. Low scores are desirable, as they indicate lower energy use than comparable buildings. However, this low score is due largely to underuse, since approximately 25 percent of the building is used for storage space that is only lightly conditioned and uses no plug load (e.g. computers, lamps.).

On behalf of DVRPC's Circuit Rider Program[1], Practical Energy Solutions (PES) performed an energy assessment of the building to identify opportunities for energy savings. The primary finding is lack of control over the heating system. Hot water circulates continuously to the perimeter fan-coil units (FCUs), causing continuous radiant heat and occupant discomfort. To address this issue, PES recommends a two-step strategy:

1. First, as a short-term, immediate measure, fully decommission the hot-water heating/perimeter FCU system and use the existing gas furnaces in the rooftop units (RTUs). This will require installation of gas piping but will improve heating control, since the RTUs are already hooked up to programmable thermostats, and it will eliminate overheating problems now caused by continuous circulation of hot water to the FCUs. It will also yield energy savings by eliminating hot-water pumping and standby losses in the hot-water loop. This measure will require the township to install piping to the RTUs.

2. Second, as a longer-term measure, upgrade the RTUs with the highest possible efficiency package RTUs as budget allows. The existing units are more than 15 years old, in poor condition, and inefficient by today's standards.

The township recently initiated a lighting upgrade from its inefficient T12 fluorescent tubes to more efficient T8 tubes. As soon as possible, PES recommends completing the T12 lighting upgrade. However, the township should discontinue its current approach (1:1 bulb changeout) and instead install two-bulb 28W T8 fluorescent tube fixtures with reflectors and high-efficiency ballasts to replace all four-bulb T12 fixtures. This will improve light quality and output while maximizing energy savings for years to come. In addition, PES recommends upgrading all exit signs with LED replacements and delamping overlit areas. These lighting retrofit measures will eliminate nearly $6,000 in energy costs annually, and will have a payback period of under three years.

Overall, these energy conservation measures can cut electricity use 31 percent and reduce natural gas use 8 percent, saving the township more than $10,000 annually in annual energy costs at today's prices. They will also reduce CO_2 emissions due to fossil fuel use by more than 114,000 pounds of CO_2 per year, which has the same CO_2 reduction impact as removing more than nine passenger cars from the road per year or planting nearly 2,390 mature trees. Table 1 provides a summary of calculated savings and paybacks.

[1] http://www.dvrpc.org/EnergyClimate/CircuitRider/

Table 1: Summary of Energy Conservation Measures

#	Measure Description	Annual Energy Savings	CO_2 Savings [lbs]	Energy Cost Savings [$/yr]	Estimated Project/Premium Cost*	Simple Payback [yrs]	Savings Over 15 Years
1	Use Existing Roof Top Units (RTUs) for Heating	10,420 kWh	13,129	$1,970	$17,900 Project*	9	N/A
		774 ccf	9,296				
2	Upgrade RTUs	20,692 kWh	26,072	$2,360	$11,950 Premium	5.1	$23,603
3	Finish Lighting Renovation	52,544 kWh	66,205	$5,993	$14,314 Project	2.4	$75,581
Other Measures							
-	Replace Weatherstripping on Exterior Doors						
TOTAL		**83,656 kWh**	**114,702**	**$10,323**	**$44,164**	**4.2**	**--**
		774 ccf					

Note: *Payback for the RTU upgrade is based on the cost difference between high-efficiency and standard-efficiency units (i.e., premium cost), as these items will need to be replaced anyway. Savings show the long-term benefit of investing in efficiency measures up- front. Additional costs for piping to connect to the RTUs is not included in this estimate and will need to be evaluated.Cost savings for all measures are based on current energy prices and change as energy prices change.
Source: Practical Energy Solutions for DVRPC 2014

Building Description

The Bristol Township Administration and Police building (32,160 ft^2) is a multi-use facility housing administrative offices, the police department, a community meeting room, and a storage area. The concrete block building, constructed in 1962, has one above-grade level and a basement level. Renovations in 2004 and 2012 included new boilers, new windows, and a partial lighting renovation.

The office area is typically occupied about 40 hours per week. The police department operates 24/7, but not all areas are occupied continuously. Meetings are held in the community meeting room approximately six times per month, and the storage area has some occupancy due to a small office.

The building systems range in condition from good to poor.

Historic Energy Use

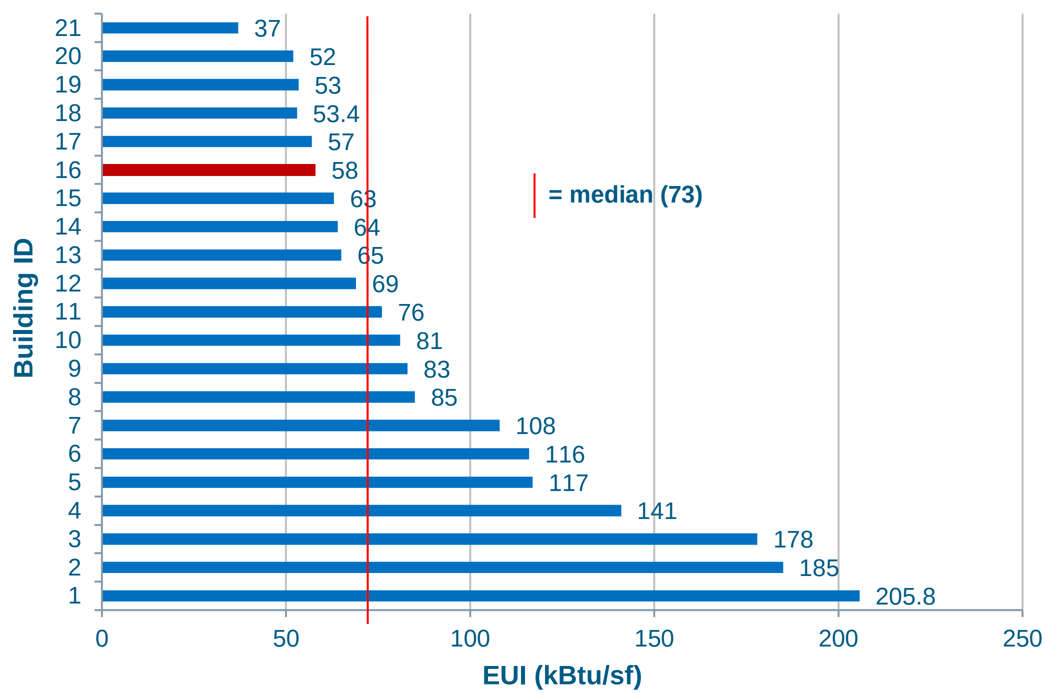
Annual Energy Costs

From September 2011 through August 2012, Bristol Township spent $40,054 on energy for the Administration and Police building. The majority of this expense (76 percent, $30,730) was for electricity; the remainder ($9,324) was for natural gas. The annual cost of energy per square foot was $1.25.

Annual Energy Use

The building's energy use intensity (EUI)—a measure of total energy use per square foot (kBtu per square foot)—is 58, lower than the median score of 73 for similar facilities in our region, as shown in Figure 1 below.

Figure 1: Local Administration/Police Facility EUI Scores



Note: EUI data set courtesy the Delaware County and DVRPC Circuit Rider Program.
Source: Practical Energy Solutions for DVRPC 2014.

CO_2 Emissions

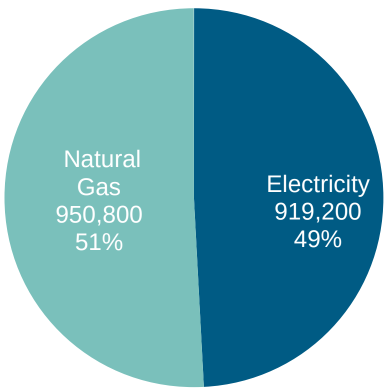
Total energy use at this building is responsible for approximately 450,400 pounds of CO_2 emissions annually—the emissions equivalent of 40 passenger cars per year. 75 percent of emissions were due to electricity use, and the remaining 25 percent were due to natural gas use.

Energy End Uses

To determine the most appropriate energy conservation measures (ECMs), it is important to understand how building systems consume energy. PES developed the following breakdown of energy end uses (i.e., lighting; heating, ventilation, air conditioning (HVAC); pumps, etc.) based on historical utility use and our site walkthrough:

- On a Btu basis, approximately half of all energy used is from electricity and half is from natural gas use, as shown in Figure 2 below.

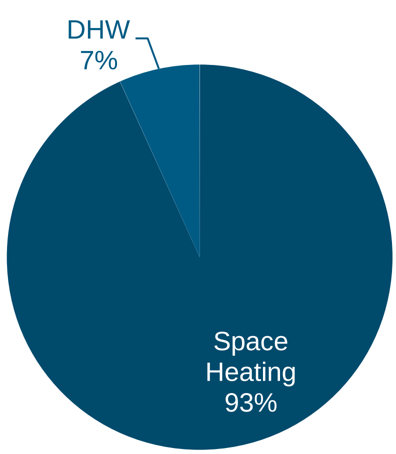
Figure 2: Energy Use in kBtu (10^3 Btu)



Source: Practical Energy Solutions for DVRPC 2014

- Ninety-three percent of natural gas is used for heating; the remainder heats domestic hot water (DHW) as shown in Figure 3 below.

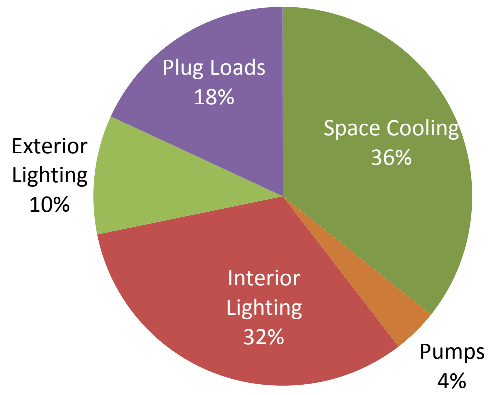
Figure 3: Natural Gas End Uses



Source: Practical Energy Solutions for DVRPC 2014

- Air conditioning consumes 36 percent of all electricity, and lighting consumes an additional one-third of electricity. Figure 4 shows all electricity end uses.

Figure 4: Electricity End Uses



Note: Plug Load = computers, desk lamps, printers, faxes, copiers vending machines, other plug loads. **Source:** Practical Energy Solutions for DVRPC 2014.

Scope of Analysis

PES performed a general walkthrough of the Bristol Administration and Police building to identify opportunities to reduce energy use and costs looking at all of the systems.

HVAC

HVAC: Findings

This building is heated via a perimeter hot-water system comprising three Weil McLain PFG boilers (305 MBH[2] each, 81 percent thermal efficiency) and perimeter FCUs. The boilers were replaced in 2004 and are in good condition, but the FCUs are in very poor condition and have manual fan controls as shown in Figure 5. Hot water circulates continuously through each coil regardless of fan operation or heat call, and uncontrolled, continuous radiant heat causes overheating, occupant discomfort, and wasted energy. During our site visit, outside air temperature was 35°F, but windows were open due to excessive heat indoors.

Figure 5: Fan Coil Unit (left photo) with Manual Controls (right photo)

Source: Practical Energy Solutions for DVRPC 2014

[2] Thousand BTUs per hour

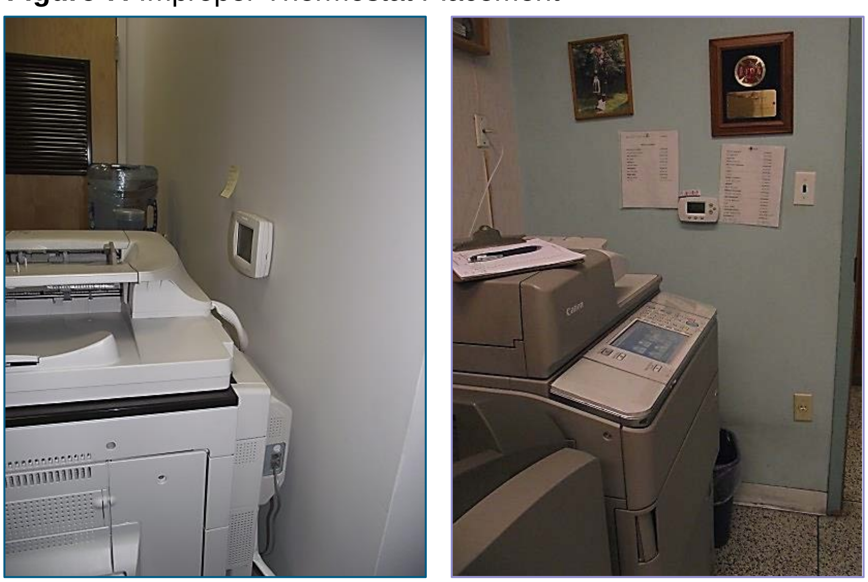
Appendix A contains an inventory of HVAC equipment. Primary cooling and air distribution is provided by 13 package RTUs, 12 of which are Lennox units manufactured in 1997. The units were in storage for 15 years before being placed into service in the winter of 2011–2012. The RTUs, which appear to have been stored outside, are in poor condition despite their short service life. Their efficiency is also low by today's standards, and while they have natural gas heating capabilities, they are not connected to a gas line. Despite the gas line penetrations through the roof, as shown in Figure 6 below, these lines are not connected to anything; there is no existing natural gas piping running through the building to serve the RTUs.

Figure 6: Typical Package Rooftop Unit, gas line disconnected

Source: Practical Energy Solutions for DVRPC 2014

PES also noted that large copiers and printers are placed directly under thermostats in several areas of the building, as shown in Figure 7 below. These copiers emit significant heat directly to the thermostat temperature sensors, which can cause the air conditioning to run excessively and, when used to control heating, prevent heat from turning on. This causes employee discomfort and increases the use of space heaters and fans, which further suppresses the central HVAC system and increases energy expenses.

Figure 7: Improper Thermostat Placement



Source: Practical Energy Solutions for DVRPC 2014

HVAC: Recommendations

Short-Term Recommendation

- As a short-term measure, PES recommends installing gas service to the RTUs, disabling the hot-water system and using the gas furnaces installed in the RTUs. This will allow both heating and cooling to be controlled via the existing, programmable thermostats and is the least expensive way to eliminate the overheating problems and to reduce maintenance costs. It will also yield some energy savings by eliminating hot-water pumping and standby losses in the hot-water loop.

- The copiers and printers should be moved away from the thermostats to ensure proper operation and improved employee comfort.

- The boilers should not be decommissioned immediately; rather, the measure outlined above should be tested first to ensure that heating from the RTUs is adequate. When decommissioning is validated, however, be sure to fully decommission pumps and boilers so they do not continue running. As shown in Table 2, this measure may reduce energy costs by nearly $2,000 per year. Although the cost of running the gas lines represents a capital investment, facility investments will be necessary given the aging conditions of the HVAC systems.

Table 2: Savings: Disconnecting FCUs/Enabling RTU Furnaces

Annual Energy Savings		CO_2 Savings [lbs]	Energy Cost Savings [$/yr]	Est. Project Cost	Simple Payback [yrs]
10,420	kWh	13,129	$1,970	$333	0.2
774	ccf	9,296			

Note: Programs like the *PA Local Government Capital Projects Loan Program* for municipalities with populations <12,000 can help finance projects like this. This 2% interest loan would greatly reduce the cost to the municipality or, if taken over a 10-year period, neutralize the cost altogether when the $2,000 annual energy savings are considered.[3].
Source: Practical Energy Solutions for DVRPC 2014

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Long-Term Recommendation

As a second step, the township should develop an HVAC replacement plan to begin replacing the aging RTUs with the highest possible efficiency heating/cooling package RTUs (12-14 EER[4], >80 percent AFUE[5]). Despite their short service life, the 12 Lennox RTUs manufactured in 1997 are in poor condition. While the efficiency of package units is inherently limited by their “off-the-shelf” configuration, this measure will nevertheless improve cooling efficiency by an average of 30 percent compared with the existing units and may result in annual energy savings of more than $2,300 per year.

These “high-efficiency” package units are available from several manufacturers, including Lennox. Provided the township follows PES’ short-term recommendation and disables the hot-water system, this plan can be phased in unit-by-unit, as funds become available.

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[3] See http://www.newpa.com/find-and-apply-for-funding/funding-and-program-finder/local-government-capital-project-loan-program-lgcpl
[4] Energy efficiency ratio
[5] Annual fuel utilization efficiency

Table 3 shows the potential energy savings (heating and cooling) associated with this measure and the premium cost of installing “high-efficiency” versus standard-efficiency package units (approximately 20 percent).

Table 3: Savings: Package RTU Upgrade

Annual Energy Savings [kWh]	CO_2 Savings [lbs]	Energy Cost Savings [$/yr]	Est. Premium Cost	Simple Payback [yrs]	Savings Over 15-Year Unit Life
20,692	26,072	$2,360	$11,950	5.1	$23,603

Notes: Payback is based on the premium cost, or cost difference between a standard-efficiency and a high-efficiency package RTU, as these units will need to be replaced anyway. All savings based on current electricity rate. Savings will vary as electricity prices change.
Source: Practical Energy Solutions for DVRPC 2014

Lighting

Bristol Township is in the process of upgrading its outmoded T12 fluorescent fixtures to mostly 32W T8 fixtures and is using a 1:1 changeout ratio. Many areas remain to be upgraded. PES recommends continuing the upgrade as follows:

- For all existing T12 lamps:
  - Replace all T12 lamps with high-efficiency T8 lamps and new fixtures (17W for 24″ lamps, 28W for 48″ lamps, 86W for 96″ high-output lamps).
  - Replace all T12 four-lamp fixtures with T8 two-lamp fixtures. Choose a fixture that has **reflectors** to direct light down into the room, enhancing light spread and output.
  - Consider high-efficiency programmed start ballasts for all new T8 fixtures. Programmed start ballasts are more expensive than the standard “instant-start” ballasts, but they pay for themselves over time because they further reduce energy use and preserve the life of the bulbs, thereby reducing maintenance costs. Programmed start ballasts require a special lamp, as most T8 lamps are designed for the instant start ballast.
  - Select a ballast with a **low ballast factor**. This will save energy and further reduce operational lighting costs.
  - Buy **new lenses** with your new fixtures; using old, dirty lenses will compromise light quality and output.

  The result of these retrofits is an approximate 65 percent reduction in electricity use per fixture, with notably improved light output and quality. This measure will also reduce the total number of lamps in this building by 20 percent, saving approximately $100 per year in lamp replacement costs.

- As existing 32W T-8 bulbs burn out, replace them with higher-efficiency 28W T-8 bulbs for additional energy savings.
- Delamp: Consider removing some fixtures altogether. During the assessment, PES noted several overlit areas that are listed below in Table 4. In these spaces, consider removing some fixtures altogether. As select fixtures are removed, be sure to recycle lamps and ballasts, and permanently terminate unused electrical connections. Recycling is important due in part to mercury in the lamps.
- Replace all incandescent exit signs (approximately 40W) with LED exit signs (approximately 10W).

Table 4: Overlit Areas

Area	Footcandles	
	Actual	Recommended*
Public Works Office	109.2	30-50
Finance Office	126.0	30-50
Community Development Office—Front	78.0	30-50
Community Development Office—Back	103.0	30-50

Note: *Energy Standard for Buildings Except Low-Rise Residential Buildings, ASHRAE/IESNA Standard 90.1 (2004), Lighting Handbook Reference and Application, 9th ed., Illuminating Engineering Society of North America.
Source: Practical Energy Solutions for DVRPC 2014

Table 5 below shows the potential energy savings associated with the T-12 and exit sign upgrades, and delaming of overlit areas. PES recommends performing these upgrades as soon as possible, as the current T-12 lighting is consuming more than $5,000 annually in excess energy costs. Table 5 does not capture any additional savings estimated from upgrading from 32W to 28W T-8 bulbs and decommissioning fixtures in overlit areas. These additional measures are recommended, as they will further increase the township's annual energy savings and cut payback time.

Table 5: Savings: Lighting Renovation

Annual Energy Savings [kWh]	CO_2 Savings [lbs]	Energy Cost Savings + Avoided Replacement Costs [$/yr]	Estimated Project Cost*	Simple Payback [yrs]
52,544	66,205	$5,993	$14,314	2.4

Note: *Project cost assumes in-house labor. Using an outside contractor will increase costs by an estimated $8,300 and extend the payback to approximately 4.5 years.
All savings are based on current electricity prices and change as energy prices change.
Project costs are estimated from RSMeans 2011 Construction Cost Data guide and PES experience with lighting projects in the region.
Source: Practical Energy Solutions for DVRPC 2014

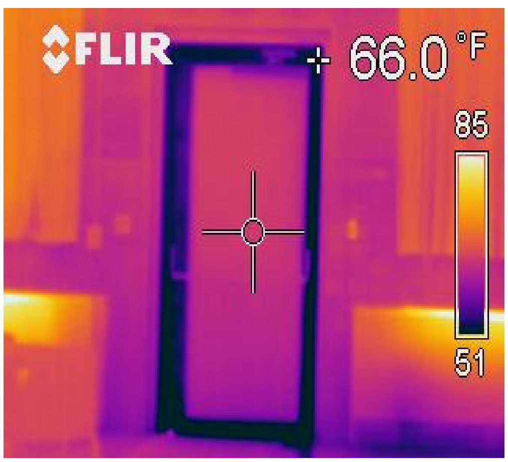
Building Envelope

PES investigated major building envelope components including walls, windows, and doors for signs of poor energy performance. The building envelope is generally in good condition. The windows were replaced in 2012 and are 1″ insulated, low-e, metal-frame units in excellent condition. On the day of the site visit, the roof was covered with snow, so roof condition could not be accurately assessed. PES did not perform any destructive testing on the roof or walls to determine existing insulation levels.

Doors

Several exterior doors have inadequate weatherproofing and door sweeps, and they have visible air gaps around the frame and door bottom. Figure 8 below shows an infrared image taken from the inside of the building of an exterior door that was captured during PES' site visit. The temperature was measured using an infrared camera. The temperature in the circle centered in the photo is 66°F, while the temperature around the frame and bottom of the door measures closer to 50°F, indicating significant air infiltration. In many cases, this is a relatively simple fix requiring new weather-stripping around the door frame and a door sweep on the bottom. PES recommends installing a high quality vinyl weather-stripping product with a metal backing that is mechanically attached (bolted) to the door. Adhesive-backed weather-stripping is inadequate and should be avoided.

Figure 8: Exterior Door Air Infiltration



Source: Practical Energy Solutions for DVRPC 2014

Appendix A

Appendix A. Inventory of HVAC Equipment

Description	Serves	Make/Model	Year	Cooling				Heating			
				Capacity [Units]		Efficiency [Units]		Capacity [Units]		Efficiency [Units]	
Outdoor CU	Emerg. Mgmt Ofc	NCP S240A-19K10-O		18,500	Btu/h	9.5	EER				
Outdoor CU		Goodman CK36-30	2002	34,000	Btu/h	9.0	EER				
Outdoor CU	IT/Photo Room	Carrier 24ABB324W310	2011	22,400	Btu/h	10.8	EER				
Outdoor CU	Locker Room	Ruud UAKB-030JAZ	2004	30,000	Btu/h	9.5	EER				
Cooling Only RTU	Comm Dev, Conference	Lennox GCS16-024-50-1P	1997	23,200	Btu/h	8.7	EER	40,000	Btu/h	80%	AFUE
No Longer In Use		Reznor									
Cooling Only RTU	Twp Mgr	Lennox GCS20V-513-75-1Y	1997	46,500	Btu/h	10.7	EER	58,000	Btu/h	78%	AFUE
Cooling Only RTU	Finance Ofc, Hall, PW	Lennox GCS24-813-130-2Y	1997	76,000	Btu/h	9.5	EER	104,000	Btu/h	80%	AFUE
Cooling Only RTU	Twp Secretaries	Lennox GCS24-813-130-2Y	1997	76,000	Btu/h	9.5	EER	104,000	Btu/h	80%	AFUE
Heating/Cooling RTU	Tax Office	Trane YHC072E3RMA06G	2010	73,000	Btu/h	11.5	EER	97,200	Btu/h	81%	AFUE
Cooling Only RTU	Police Records	Lennox GCS24-653-130-1Y	1997	61,000	Btu/h	8.9	EER	104,000	Btu/h	80%	AFUE
Cooling Only RTU	Council Chambers	Lennox GCS20V-513-75-1Y	1997	46,500	Btu/h	10.7	EER	58,000	Btu/h	78%	AFUE
Cooling Only RTU	Detectives Offices	Lennox GCS24-653-130-1Y	1997	61,000	Btu/h	8.9	EER	104,000	Btu/h	80%	AFUE
Cooling Only RTU	Investigation Offices	Lennox GCS20-048-120-1Y	1997	48,000	Btu/h	10.1	EER	96,000	Btu/h	80%	AFUE
Cooling Only RTU	Police Chief	Lennox GCS24-813-130-2Y	1997	76,000	Btu/h	9.5	EER	104,000	Btu/h	80%	AFUE
Cooling Only RTU	Sgt, Cells	Lennox GCS24-653-130-1Y	1997	61,000	Btu/h	8.9	EER	104,000	Btu/h	80%	AFUE
Cooling Only RTU	Meeting Room	Lennox GCS24-813-130-2Y	1997	76,000	Btu/h	9.5	EER	104,000	Btu/h	80%	AFUE
Cooling Only RTU	Meeting Room	Lennox GCS24-813-130-2Y	1997	76,000	Btu/h	9.5	EER	104,000	Btu/h	80%	AFUE
Hot Water Boiler	Fan Coil Units	Weil-McLain PFG-6-PIN	2004					247,000		81%	
Hot Water Boiler	Fan Coil Units	Weil-McLain PFG-6-PIN	2004					247,000		81%	
Hot Water Boiler	Fan Coil Units	Weil-McLain PFG-6-PIN	2004					247,000		81%	

Source: Practical Energy Solutions for DVRPC 2014

Appendix B

Appendix B. Bristol Township Pump Station Evaluation

Executive Summary

In 2012, Bristol Township spent approximately $50,000 on electricity for its 18 pump stations. A review of energy bills shows that three of the pump stations—Bath Road, 2nd Avenue, and Palmer Avenue—had notably higher wintertime electricity use when compared with the other stations' energy use.

On behalf of the DVRPC Circuit Rider Program, Practical Energy Solutions (PES) performed a walkthrough assessment of the Bath Road pump station to determine the cause of the high winter energy use.

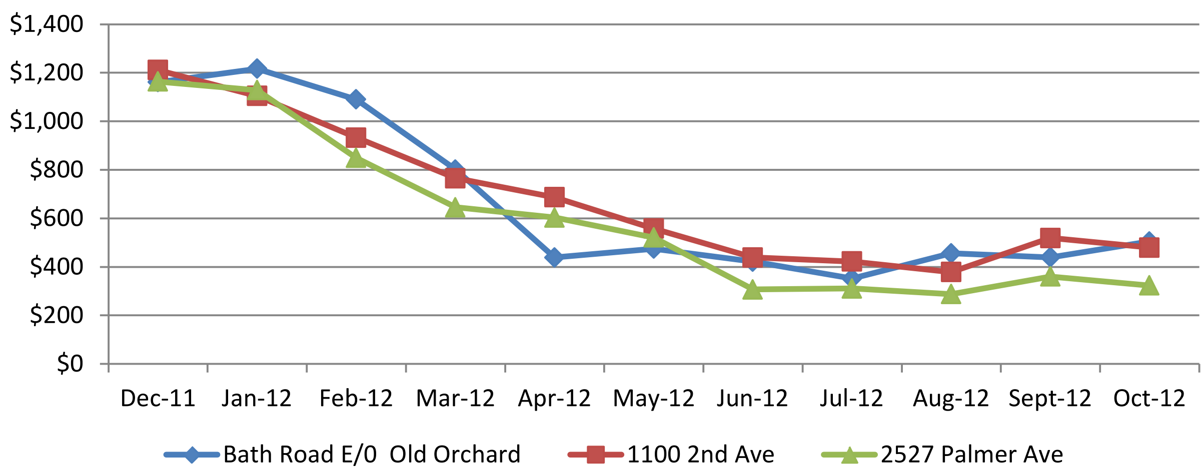
During the site visit, performed on a cool winter day, the recorded air temperature inside the station was 75°F on the ground level and 68°F below ground, even though both thermostats were set well below 60°F. This suggests that the thermostats may be malfunctioning.

Presuming the thermostats are dysfunctional, PES recommends replacing thermostats in all three pump stations. This will save Bristol Township $3,600 annually and pay off in well under one year. This will also reduce CO_2 emissions due to fossil fuel use by an estimated 41,500 pounds—the equivalent of removing almost four passenger cars from the road or planting 866 mature trees.

Introduction

In 2012, Bristol Township spent approximately $50,000 on electricity for its 18 pump stations. A review of energy bills shows that three of the pump stations had notably higher wintertime electricity use when compared with the other stations' energy use. Specifically, the Bath Road, 2nd Avenue, and Palmer Avenue pump stations had peak wintertime energy use that was as much as 75 percent higher than summertime energy use, as shown in Figure 9 below.

Figure 9: Selected Pump Station Energy Costs (11 months, 2011–2012)



Source: Practical Energy Solutions for DVRPC 2014

At the township's other pump stations, energy use did not typically follow this pattern, suggesting that the high wintertime electricity use at these stations is due to factors other than snow or rainfall.

On behalf of the DVRPC Circuit Rider Program, Practical Energy Solutions (PES) performed a walkthrough assessment of the Bath Road pump station to determine the cause of the high winter energy use.

Findings

This pump station contains three 10-horsepower pumps, a backup generator, two electric unit heaters with wall-mounted thermostats, and fluorescent and incandescent light fixtures. PES found that the pump station indoor air temperature felt quite warm. The recorded air temperature was 75°F on the ground level and 68°F below ground, even though both thermostats were set as low as possible, well below 60°F. Figure 10 below shows the station's ground-level unit heater and its thumbwheel thermostat reading below 60°F. This indicates that the unit heaters were operating without control. While it is possible that the unit heater is not responding to the thermostat, PES suspects that the thermostats are dysfunctional.

Figure 10: Ground-Level Unit Heater, with low thumbwheel setting

Source: Practical Energy Solutions for DVRPC 2014

Recommendation

PES recommends replacing the two wall-mounted thermostats in the Bath Road pump house and setting the new units no higher than 55°F. During installation, the unit heater should be evaluated to ensure that it is functioning properly and responding to the thermostatic control. If needed, the unit heater should be repaired/replaced.

This should be sufficient to prevent freezing while optimizing energy conservation. Based on the conditions observed during the site visit, this measure could reduce electricity use at this pump station by approximately 17 percent, saving $1,250 per year at today's electricity prices.

PES also recommends inspecting the thermostats at 2nd Avenue and Palmer Avenue pump stations. Presuming similar conditions, we suggest instituting this same measure in these pump stations as well.

At all three stations, this energy conservation measure will save Bristol Township $3,600 annually and pay off in well under one year.

Bristol Township Energy Assessment

Township Administration Building and Pump Stations

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Date Published: April 2016

Geographic Area Covered: Bristol Township

Key Words:

Energy, natural gas, electricity, energy management, heating ventilation air conditioning (HVAC), fan coil unit, boiler, roof top unit, thermostat, lighting, delamping, CO_2 emissions

Abstract:

On behalf of the DVRPC Circuit Rider Program Practical Energy Solutions (PES) performed an energy assessment of the Bristol Township Administration Building. The Bristol Township administration building (32,160 ft^2) is a multi-use facility housing administrative offices, as well as the police department, a community meeting room, and a large storage area. The primary finding is lack of control over the heating system caused by hot water continuously circulating through the building's perimeter fan coil units (FCUs), causing continuous radiant heat and occupant discomfort. To address this issue, PES recommends that the township decommission the fan coil units and install natural gas pipes to the building's roof top units to enable the use of the existing RTUs for space heating. Further, PES recommends that the township develop an HVAC replacement strategy to upgrade the RTUs with the more efficient models as budget allows. Further, PES provided technical refinements to the township's existing lighting upgrade and delamping strategy, and estimated the energy and cost savings associated with that measure. Overall, these energy conservation measures can cut electricity use 31 percent and reduce natural gas use by 8 percent, saving the township more than $10,000 annually in annual energy costs at today's prices. They will also reduce CO_2 emissions due to fossil fuel use by more than 114,000 pounds of CO_2 per year.

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