Bloomfield Township

Memorandum

To: Bloomfield Township Department Heads

From: Noah Mehalski, Environmental Specialist, Engineering & Environmental Services

Subject: Energy Audit & Retrofit Program Update

Date: November 29, 2010

cc: File

Background

As part of the American Recovery and Reinvestment Act (ARRA) of 2009, Bloomfield Township applied for and received grant funding in the amount of $169,500.00 from the Department of Energy to perform an Energy Efficiency and Retrofit Program. The program involved the performance of a Technical Energy Audit in Phase I and will involve implementation of as many of the suggested retrofits, as funding allows, during Phase II.

Update

A Final Draft of the Technical Energy Audit (TEA) report was submitted to the Township for review on November 15, 2010. The report includes an assessment of the current state of each Township-owned building including evaluation of the building envelope (interior & exterior) and its systems (HVAC, lighting, etc.). The report includes a list of suggested retrofits that are prioritized by a cost vs. benefit analysis for each suggested retrofit project. The report also seeks to quantify the energy savings realized due to the Township's shift to a four-day workweek. In addition, Township staff has been actively seeking ways to not only cut energy use through increased energy efficiency but also, lower energy costs by meeting with third-party energy suppliers to discuss possible natural gas and electric service rate reductions.

Attached you will find a copy of the Technical Energy Audit performed by Spalding DeDecker & Associates, Inc. A presentation regarding the findings of the report will be given at the December 1, 2010 Department Head meeting.

Thank you,

Noah Mehalski
Environmental Specialist

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Bloomfield Township Technical Energy Audit Report

Prepared for Bloomfield Township
by Spalding DeDecker Associates, Inc. &
The Avrie Group

Bloomfield Township TEA Report Executive Summary

Executive Summary

The Technical Energy Audit (TEA) performed for Bloomfield Township has provided many Energy Conservation Measures (ECM). Savings on the low side are over $112,000/yr. and the high side savings exceeds $220,000/yr. This is 24.3% and 49.8 % respectively of the total usage of $460,000 annually. The cost to implement the savings will be $278,800 on the high side. The average ROI is 2.48 years. A summary of all the buildings potential savings is listed in Bloomfield Township TEA Executive Summary, Appendix A.

There are 165 projects that are proposed, some of which have no cost and others that cost over $15,000.

Many projects qualify for utility incentive funds, which will help reduce the installed costs.

There are five major categories that are used to identify each project. These categories are electrical, HVAC, hot water, pool issues and miscellaneous. Each building has electrical projects, most of which are lighting projects. HVAC issues were found in the majority of the buildings. All the pool issues where found in the Senior Center. Hot water issues were found in the majority of buildings as well.

The vast majority of the building equipment was maintained in very good condition. There are very few maintenance issues, but the ones found are listed under each respective building.

There are four projects which are named for each building: Employee Energy Training, Purchasing Natural Gas from Broker, Purchasing Electricity from Broker, and Energy Consumption Tracking. These four projects do not require equipment purchases, but will require effort to reap the benefits. On average, employees who are educated can make a significant difference in the energy use. In some cases, as much as 5% of the costs can be saved through education and training. Tracking energy use is important to track savings and ensure wastes are controlled.

A Township Wide Energy Strategic Plan should be developed, which will map out future expenses and Standard Operating Procedures (SOP) for energy. An example of this is to have a plan for replacing equipment with high efficiency units. This must be developed before equipment fails. If you wait for the failures, there is no time to investigate the best replacement. Water heaters, HVAC roof top units, and appliances are all critical areas in planning SOP.

Each building analyzed has a separate TEA Report & Recommendations, TEA Project Priority List, Lighting Survey, Energy Use Profile, and proposed savings and costs to implement the suggested and recommended projects.

TEA Methods and Performance

The TEA methods performed for the buildings followed the American Society of Heating, Refrigerating and Air-Conditioning Engineer (ASHRAE) Level II audit parameters. All the changes and modifications proposed utilize proven technologies.

Calculations

Each building's project savings are calculated using the site specific utility rates, hours of use, and potential for success. Projects that may be identical to another building may be beneficial in one case, but not in another, or have a different savings. This is due to site specific issues, which influence the savings and the costs to implement.

Savings and cost to implement are estimated and calculated for each project. Ranges for each exist, since many factors influence the use and operational efficiencies.

Site Visits and Document Collection

There were over 48 site visits of the 11 buildings. All buildings had at a minimum two (2) visits, and the DPS building was visited nine (9) times.

Hundreds of pages of notes were taken, hundreds of drawings where reviewed, and thousands of temperature/humidity/foot candle/CO2 readings were taken throughout the fleet of buildings audited.

Equipment operation was witnessed and inspected for proper operation and potential improvements.

The utilization of each building was observed to compare to similar buildings of like use.

Energy Use, Costs & Benchmarks

The energy costs and consumption of electricity and natural gas were evaluated. Comparisons to other similar buildings where made. In some buildings, the Energy Star Rating was calculated, however, not each building has an index under Energy Star Portfolio Manager (for example fire stations do not exist under Energy Star Portfolio Manager). The energy use Index (EUI) was calculated for each building and comparisons where made again, as data exists. The natural gas for the District Court was estimated since exact data was not presented. The data for the Township Hall was correlated to buildings the same size and use to provide the energy use. The data presented is not representative of the size and building use, thus more typical use numbers were estimated.

The energy cost per square foot has been calculated and is shown in Bloomfield Township TEA Executive Summary, Appendix A.

Four Day Work Week Energy Evaluation: Bloomfield Township

From calculations and meter readings it has been determined that the four day work week does save energy. More can be done during the heating season to confirm the savings.

Methods Used to Calculate Savings

Bloomfield Township went to a four day work week in 2008 which has lead to lowered energy use.

Employees are scheduled to work 40 hours each week, excluding holiday weeks. In the conventional work week the hours of the offices and buildings would work eight hours a day, five days a week. Each day the buildings are scheduled for employees to work, the building is required to use energy to heat air, cool air, light spaces, heat water, and other miscellaneous uses.

The difference in the four day work week is one less lunch per week, and two less break periods. The hours of operation run 10.5-11 hours per day or 44 hours per week, resulting in a reduction of six hours compared to the five day schedule. This is equal to a 12% in reduction in operations of lights and HVAC operations, and the buildings with setback HVAC controls require one less building startup per week. Startups consume 8-15% of energy each day, which depends on the control methods, calibration, and equipment systems.

Estimated Method

Evaluation of the HVAC systems that are on the EMS show energy savings on each Friday versus if the building where operating. It is estimated that between 12-25% savings is being achieved for this one day. There is a 1.5-3.5% increase in energy use for Monday-Thursday energy use. Therefore, the days Monday-Friday would see a 12-(1.5*4) = 6% for HVAC, when averaged over the seven days the savings drops to 4.2% for the week.

The savings from this method are shown in the table below:

Energy Type Saved	Low side Percentage Savings	High Side Percentage Savings	Total Annual Dollar Costs	Annual Low Side Dollar Savings	Annual High Side Dollar Savings
Natural Gas	3.5	4.2	$141,971	$4,969	$5,963
Electricity	3.5	4.2	$319,262	$11,174	$13,409
Total, Gas & Electricity	3.5	4.2	$461,233	$16,143	$19,372

Another Method

Another Method

Calculations of hours of use and turn down indicate a 4.7% reduction in lighting would be expected and 2.5% reduction in HVAC energy use. The reason for such a large difference is that the lights can be turned almost completely off in most cases while the HVAC cannot be reduced to zero during many hours.

Data does not exist for many of the buildings that are affected by the changes since they were newer since the changes were implemented. The police station, animal shelter, fire stations, judicial building and senior center will not show a great deal of change since there hours have not changed.

Meter readings taken on a daily basis for 14 days between August 24 and September 7, 2010 show savings in electric and natural gas for the DPS building. The township building meter readings were skewed for natural gas use due to the backup generator. The electric readings for the township show a 27% reduction on the three days Friday-Sunday. The PS building showed a 39% and 58% decrease for electric and natural gas respectively.

Adjusting for the use of 44 hours per week versus 45 hours will result in an extra hour per week being added for start up and shutting the building down each day, the savings per day for the PS building is 2.4% on the weekly usage for electricity. The saving for the Township Hall is 1.7% for electric, and the usage for natural gas is not evident from the reading since there was very little use. The readings should be reviewed during the heating season when more natural gas is consumed.

The savings from this method are shown in the table below:

Energy Type Saved	Low Side Percentage Savings	High Side Percentage Savings	Total Annual Dollar Costs	Annual Low Side Dollar Savings	Annual High Side Dollar Savings
Natural Gas	Not enough data	Not enough data	Not enough data	Not enough data	Not enough data
Electricity	1.7%	2.4%	$319,262	$5,427	$7,662

Total Savings:

Overall, there is savings from going to a 4 day week of between 1.7-4.2% for electricity. The natural gas savings falls between 2.5-4.2%. The natural gas is extrapolated using the electric use data, resulting on the low side of 2.5%.

The annual dollar savings using the low side and high side of the two methods equates to:

Natural Gas Annual Savings: $141,971 X .025 = $3,549 low side, $141,971 X .042 = $5,962 high side.

Electrical Gas Annual Savings: $319,262 X .017 = $5,427 low side, $319,262 X .042 = $13,409 high side.

Total energy savings from the four day week work schedule is between $8,976 and $19,372 annually.

Below is a table showing the savings range from both methods:

Energy Type Saved	Low side Percentage Savings	High Side Percentage Savings	Total Annual Dollar Costs	Annual Low Side Dollar Savings	Annual High Side Dollar Savings
Natural Gas	2.5%	4.2%	$141,971	$3,549	$5,963
Electricity	1.7%	4.2%	$319,262	$5,427	$13,409
Total, Gas & Electricity	1.9%	4.2%	$461,233	$8,976	$19,372

Proposed Energy Projects for Bloomfield Township

Each building has a TEA report showing details listing all potential energy conservation projects. Below is the prioritized list of projects for all eleven (11) township buildings audited by the Avrie Group. A general list of the projects are shown in Appendix B, Bloomfield Township Prioritized Energy Conservation Projects.

The projects are prioritized using a scale of 1-5:

1: 0-2 year ROI

2: 2.1-5 years ROI

3: 5.1-10 years ROI

4: 10 + years ROI

5: Other justification than energy ROI

Highest Recommended Projects

There are eight (8) projects that are justified to be implemented at each building, which are a 1 priority, and all have a ROI of 2 years or less. Some will only require implementation in the future when equipment is past its useful life and needs replacement. Some of these projects are useful in all buildings but are already being conducted in some of the buildings: i.e. building heating temperatures need to be lowered in some buildings and in other buildings it must be ensured they kept the temperatures in the desired ranges. These eight (8) types of projects account for a total of 74 projects listed in the separate building TEA Reports. The eight (8) project types are as follows:

1. Energy Training for Employees
2. Purchase Natural Gas from Broker
3. Purchase Electricity from Broker
4. Track Energy Usage on Monthly Basis
5. Purchase Energy Star Products
6. Heating Set Points Changes
7. Cooling Set Points Changes
8. Utility Rebates

The projects listed for each building under the above eight (8) types of projects, along with the remaining 2 year or less ROI projects, hot water replacement with existing township water heaters, and

all the exit sign projects, account for $94,265 per year savings. The savings is 20.4% of the annual energy bills for the Township. The cost to implement these projects is $124,650. Thus, the ROI for these combined projects is 1.32 years. The cost to implement may very well be less since projects such as training and exit signs will be done with Township personnel. The costs factored into the project ROI figured contractors performing the work.

Several projects that are not common to all the buildings that should be implemented are:

- EMS Tune up for buildings
- Drinking fountain timers
- Vending machine timers
- Thermostats replaced with password protected units
- Pool cover
- Pool water temperature
- Natatorium humidity increase
- Reduce static pressure in building air systems in PS Building
- Purchase electricity during off-peak hours prior to office hours
- Purchase high efficiency motors
- Purchase cog belts versus v-belts

The three hot water heaters are not needed and should be turned off. The cost to shut them down is minimal and can be accomplished with Township maintenance employees. These hot water heaters are in the PS Building and the PS Annex, which can be removed and used in other township buildings. The Cable Building, Animal Shelter and #2 Fire Station water heaters should be replaced with the heaters removed. These individual projects will have a higher ROI when using the removed heaters from the PS Buildings.

Replacement of the exit signs will be less than what is factored into the ROI if installed by the Township maintenance staff. There are 41 exit signs that can be upgraded to LED units and save tremendous amounts of energy.

No Cost Projects

Of the eight (8) project types shown above, seven (7) of the eight (8) can be implemented at no cost. The exception is Project 5, which is purchasing Energy Star Products. Other projects that should be implemented and do not require equipment purchases or any other costs are shown below:

- The pool water temperature can be decreased and the pool room relative humidity can be increased without any equipment purchases. These projects will provide a large energy savings and are Priority 1.
- The pool room humidity should be increased, which will save a great deal of energy. This can be accomplished with existing control systems.
- Employees entering the PS Building offices must be instructed to use the door entries from the garage. The East Entrance does not have a vestibule, which leads to excessive heat losses in the winter and heat gains in the summer.
- Purchasing electricity during off peak hours in the morning before the offices open can primarily be accomplished in the PS Building.

Premium Efficiency Units

All replacement or new motors purchased should be premium efficiency, which will require an increase in the price over the nominal efficiency units.

The equipment in the township which uses v-belts should be converted to cog belts. All new equipment which requires belt drives should be specified with cog belt drive systems.

There is going to be a time many of the longer term ROI (2 years or more) projects will require replacement. At these times the higher costs for premium high efficiency should be installed versus the nominal efficiency units. It is recommended for these projects that the Township be prepared to replace the units when they fail. The increased replacement cost will save tremendous amounts of energy, which will be paid back very quickly. Examples of these projects are boilers, roof top HVAC units, and the pool water heater.

Longer Return on Investment Projects to Consider

There are a few projects that are not viable projects if they are evaluated on their ROI (these projects have an ROI of 8 + years). These projects typically would not be considered, but this may be the strategic time to implement a few:

- Boiler Replacement, Township Hall Basement: 9.3 ROI, $12,500 to implement, and savings $1,350
- Roof Top Unit HVAC, Township Building: 8.5 ROI, $9,800 to implement, and savings of $1,150.
- Occupancy Sensors in Buildings: As many as 150 separate sensors would need installed throughout the Township. Installed by contractors, these units can be as high as $300 per unit equal to $45,000 for all the units. This cost can be reduced significantly if the Township

staff installs them. Thus, these projects can have lower ROI if managed and installed by Township maintenance staff.

- T12 Bulbs and Ballasts Replaced with T8 Bulbs and Electronic Ballasts: The projects will be much less costly if the Township maintenance staff installs the equipment.

Temperature Set Points for Buildings: Bloomfield Township

The issue of what temperature to run the offices, garages, work areas, fire stations, etc. is discussed below:

ASHRAE has developed a standard, Thermal Environmental Conditions for Human Occupancy, 55-2004, with specifications for temperature ranges. ASHRAE has temperature recommendations relating to indoor temperatures when compared to outside air temperatures. The recommendations are established, which is acceptable for 80% and 90% of people working in naturally conditioned spaces.

The mean monthly outdoor air temperature influences the indoor temperature expectations of people in the buildings. For example, if the outside air (OA) temperature is 50 degrees F, the indoor air ranges between 63-76 degrees F for 80% of occupants to be comfortable, while 90% of occupants' comfort range is 66.4-73.8 degrees F; the tighter the range, the more people who fit into the comfortable range. Thus, when temperatures are too high in the heating season, there become people who are not comfortable, just as when it gets to cold.

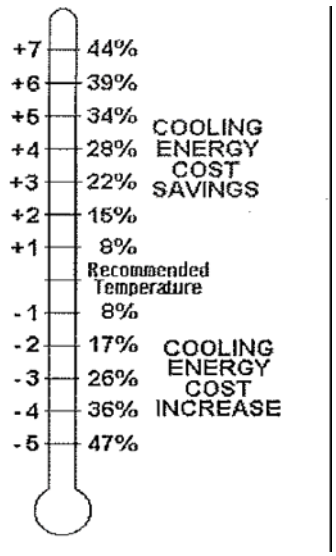
If the set point is set at +/- 1.5 degrees around the set point of mid 70 degrees F, the building temperatures will be good, with OA being 50 degrees F. With the OA temperatures at 10 degrees F, the range of heating comfort actually goes down slightly, with humidity playing a factor in the comfort. Since all the buildings in the Township are not humidified, the dry winter air makes it feel cooler.

The comfort ranges are from 67-81 degrees F when the humidity is 50-85% Relative Humidity (RH). The temperature range goes to 70-82 degrees F when the humidity is 20% RH. Since there is no humidity control and it is expensive to humidify office buildings, expectations for humidity should be in the mid range of 40-60% RH, where temperatures will be acceptable at 68-81 at 40% RH, and 67-80 for 70% RH.

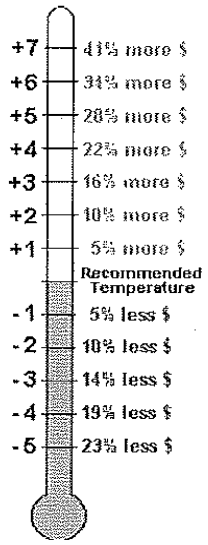
The Department of Energy recommends ranges of 68-72 degrees F in the winter months. Summer months range between 72-76 degrees F.

Energy use is effected tremendously by each 1 degree increase of the set point temperature. During the heating season, each one degree above a set point of 68-72 degrees F will consume 6% more energy and 10% more for a 2 degrees F increase above the set point.

In the cooling months, 1 degree lower in the actual temperature (below 74- 76 degrees F set point) will increase the energy use by 8%, 2 degrees will consume 17% more energy.



Cooling



Heating

The storage rooms, bathrooms, corridors, and garages are all areas that the temperature should be adjusted lower in the winter and warmer in the summer.

For example the DPS building large truck garage should be 55-60 degrees F in the winter, preferably lower. The apparatus rooms in the fire stations should be operated at a lower temperature in the winter than the rest of the building, which is not always the case in all four stations.

The offices should be kept at 68-72 degrees F in the winter and 74-76 degrees F in the summer. This is not the normal condition in many of the buildings.

The table below shows the recommended temperatures for various buildings and different use areas:

Building Type	Heating low set point	Heating High Set Point	Cooling AC Low Set Point	Cooling AC High Set Point
Garages	55 Degrees F, even lower to 50 Degrees F is acceptable	60 Degrees F	AC not recommended	AC not recommended
Offices	68 Degrees F	72 Degrees F	74 Degrees F	76 Degrees F
Fire Stations Apparatus Rooms	60 Degrees F	65 Degrees F	AC not recommended	AC not recommended
Storage Areas, Mechanical Rooms	55Degrees F	65 Degrees F	80 Degrees F, in building with offices, all others not recommended	84 Degrees F, In buildings with offices, all others not recommended
Computer, IT areas	65 Degrees F	69 Degrees F	72 Degrees F	74 Degrees F
Restrooms and Corridors	65 Degrees F	69 Degrees F	78 Degrees F	80 Degrees F

It should be a Standard Operating Procedure (SOP) that all employees are educated on what the difference means to the Township. Just setting thermostats back will not accomplish the goal. The thermostats need to be controlled and managed. This is the reason password protected thermostats are recommended for each building. The buildings with the EMS controls should be maintained at recommended set points and not allowed to be varied.

BLOOMFIELD TOWNSHIP HALL TEA REPORT

The Township Hall is made up of offices, locker rooms, bathrooms, jails, large meeting rooms, exercise rooms, and storage areas. In total this is a 25,510 square foot building. Annual energy costs total $66,450 with $41,900 for electricity, and $24,550 for natural gas. These numbers have been adjusted from what was on the bills, the numbers where so low we had to adjust. Further review may be required to get a good benchmark. This will not affect the savings numbers. The building energy consumption is at 144.9 KBTU/sq. ft. and the cost is $2.60/q. ft. The average for a similar building in identical climate is 80-140BTU/sq. ft. depending on many variables such as size, floors, year built, etc. When comparing to other buildings it can be seen there is room for improvement in this building.

The Technical Energy Audit (TEA) includes: TEA Report and Recommendations, Appendix A: Potential Project Listing; Appendix B: Lighting Survey, TEA Audit Findings Summary Sheet with Energy Star Portfolio Manager, Natural Gas Consumption and Cost Report, and Electrical Consumption and Cost Report.

POTENTIAL PROJECTS

The Township Hall has 27 Energy Conservation Projects (ECP) which have been revealed in the Technical Energy Audit performed by the Avrie Group. There are twenty-two that are recommended to be implemented, which can save between $21,748-40,766 per year. These savings are equal to 33-61% of the last year's annual energy costs for the building. The cost to implement these projects can range between $72,945-105,260. The individual projects return on investment range between 0.8 to 11.8 years.

Utility rebate incentives can be applied to fourteen of the recommended projects discussed later in this report, although we recommend projects 1, 2, 3, 7, 8, 13, 14, 16, 17, 18, 19, 20, 21, and 22. Each incentive dollar amount will depend on the size of the units, efficiency, and other details of the equipment installed.

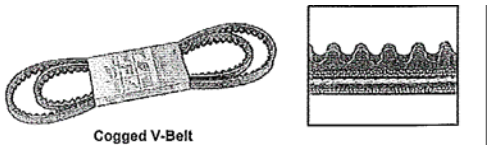
The list below shows the recommended projects to be implemented. Details of all the projects can be seen in Appendix A.

Proj. #	Project Name	Low side savings	High Side Savings	High Side Costs to Implement	Years ROI
1	Use high efficiency motors	90	180	125	1.4
2	Use cog belts	600	1,800	1,000	1.7
3	Replace Trane Roof Top HVAC unit with more efficient unit	1,150	1,700	9,800	8.5
4	Air Balance	1,800	2,600	11,000	6.1
6	Replace Trane Controls	2,900	4,000	12,000	4.1
7	Replace boiler in basement	1,350	1,800	12,500	9.3
8	Replace penthouse boiler	1,800	2,500	16,500	9.2
9	Humidity control replaced with DE system	1,350	2,600	5,900	4.4
13	Tune up boilers, if new not needed in first year	600	1,200	2,500	4.2
15	Reduce hot water use	90	180	400	4.4
16	Occupancy sensors	710	2,130	8,400	11.8
17	Replace T12 fixtures and ballasts with T8 units	1,800	2,600	21,000	11.7
18	Replace exit signs with LED units	208	540	1,600	7.7
19	Drinking fountain timers	30	36	35	1.2
20	Replace toilets with low water use units	Water savings			
21	Vending machines	420	700	800	1.9
22	Kitchen appliances Energy Star	Will depend on what is installed			
23	Employee training	300	900	500	1.7
24	Purchase natural gas from another source	2,200	6,600	500	0.2
25	Purchase electricity from another source than DTE	4,100	8,200	500	0.1
26	Track Energy use on monthly basis	250	500	200	0.8
27	Utility Rebates	Will depend on which projects are installed			
	Totals for all projects	**21,748**	**40,766**	**105,260**	**4.8 years**

Details of Recommended Projects

Project #1: High Efficiency Motors: When replacing motors in the building purchase premium high efficiency motors. There energy savings are between 1-3.6% when compared to units in operation. The costs to purchase is around $125/10 hp motor. Dollar savings can be $90-180/10 hp motor.

Project #2: Use Cogged Belts versus Standard V-Belts on Motor Drives: A savings of 1-3% can be saved by using cog belts versus standard v-belts which most of the motors are operating with. Going forward all belt changes should be made with cogged belts. There is a premium for the belts which is repaid from energy savings.



Project #3: Replace Trane Roof Top HVAC Units: Trane, 1987 unit, 7 ton, 80,000 btu/hr unit should be replaced. The roof top units can be replaced with higher efficiency SEER unit. This can save 10-30% of energy consumed on cooling side and 5-10% on heating side. There can be a savings of $1,150-1,700 per year, with an expense of $7,800-9,800.

Project #4: Air Balance: Perform an air balance of the entire building. Facility air balance is out of good operating ranges, excess energy is used in fan horsepower and cooling and heating costs. Savings from this can translate into $1,800-2,600 per year. The cost to implement can be $8,000-11,000.

Project #6: Replace Trane Controls: The present controls are outdated and can be upgraded, which will help control the HVAC systems. The repair of the units is questionable going forward since Trane does not support the system with spare parts anymore. Some type of replacement is needed; as well energy improvements will be made. Savings can be $2,900-4,000 per year for a cost of $9,000-12,000. The ROI can be 4.1 years.

Project #7: Replace Boiler in Basement: Existing boiler are at best 60-70%, the present unit is worn out. New technology boilers run at 88-93% efficiency. The unit will be difficult to get high efficiency exhaust out, but the savings will be worth it. Savings can be $1,350-1,800 for a cost of $9,200-12,500. The ROI can be 9.3 years, but the unit is at the end of its life and will need to be replaced soon.

Project #8: Replace Boiler in Penthouse: Existing boiler is 60-75% efficient. Newer units run at 88-93% efficiency, and the old unit is at end of its life and will need to be replaced sooner than later. An 840,000 BTU/hr unit may be able to be sized lower, with all the conservation projects implemented. Savings can be $1,800-2,500 for a cost of $12,000-16,500. The ROI can be 9.2 years, but the unit is at the end of its life and will need to be replaced soon.

Project #9: Humidity Control: Replace boiler providing humidity control to the facility with a DE-correlation technology type unit. Typical savings are from 50-70% savings. Bryan boiler heat input is 250,000 btu/hr, which costs $60/day to operate, full load. The replacement unit can cost $24/day to operate or 60% savings. Compressed air will be needed at high pressure to make this work properly, which is figured in the costs. The unit savings can be $1,350-2,600 per year, for a cost of $3,800-5,900.

Project #13: Tune up Boilers: Each year tune up the boilers. Once boilers are cleaned and inspected continue on an annual basis and perform a tune up of the units. On these older style mechanical linkage type boilers efficiency losses can be 5-8% from year to year. When the new boilers are added that year the tune up will not be needed, as well the units will not need tune ups each year going forward. The new technology in the boilers does not require it. Savings can be $600-1,200 per year, with costs ranging from $1,500-2,500 before the rebates from the utilities are added in.

Project #15: Reduce hot water use: Install devices in bathroom and other faucets reduce the use of hot water. A 10-20% reduction should be realized. The costs savings can be $90-180 for a cost of $150-400.

Project #16: Occupancy Sensor: Install in offices, basement, storage rooms, courtrooms, and throughout building where practical. Savings of 20-60% is typical. Savings can range between $710-2,130 per year. The savings are higher than the large garage since all the lights are left on, versus half of the large garage. The cost to install can be $5,600-8,400.

Project #17: Replace T12 Fixtures and Ballasts in Building: Replace T12 bulbs with more efficient bulbs requiring 11-15.25 watts less per bulb on average. Savings can be $1,800-2,600 per year, and the costs to install can be $13,400-21,000, with a ROI of 11.7 years.

Project #18: Replace Exit lights with LED Units: The existing exit signs use 20-50 watts per unit more than a new LED unit will, the twelve signs will be replaced. The savings can be $208-540 per year.

Project #19: Drinking Fountain Timer: Install timers on drinking fountains, so during times the facility is closed the units turn off. The cooling done during this time is a waste of electricity. Four units can utilize these timers.

Project #20: Replace Toilets with Low Water Use Units: The present units use 3.6 gallons per flush, versus 1.6 gpf for new style units which amount to a savings of 55%. There will be no direct energy savings, the only site savings will be water.

Project #21: Vending Machine Controls: Minimize energy use of vending machines, install device which will cut back consumption during schedule off periods. Reduce lighting in units and have vendors replace with high efficiency units. Two vending machines can utilize a control device to obtain these savings. Savings can be $420-700 per year, which can cost $600-800.

Project #22: Replace Kitchen and Break Room Appliances: The building does not have Energy Star refrigerator, stove, dishwasher, dryer, clothes washer, etc. On an average most kitchen equipment can be replaced, which can save between 10-20% in electricity. The savings is not large enough to justify replacement for that reason only. Although, make it policy to replace all freezers, refrigerators, dishwashers, and stoves with Energy Star products.

Project #23: Employee Training: Provide training for all employees working in the building regarding energy use and costs. Many times employees make decisions to use energy and do it without any idea how their choices affect the consumption of energy. Typical savings can be thousands of dollars to 5% of the consumption. Savings in the District Court can be $300-900 per year, for a cost of $150-500.

Project #24: Purchase Natural Gas from another Source: Natural gas can be purchased from brokers, which sell natural gas at a discount, and savings can range between $2,200-6,600 per year. This can cost $0-500 to implement.

Project #25: Purchase Electricity from another Source than DTE: Electricity can be purchased from brokers which sell electricity at a discount when compared to the utility DTE. There is a limited amount of KW that are allowed for this service in the entire DTE grid. Thus, at this time there nothing to purchase, but is soon to change this fall. Savings can reach between $4,100-8,200 per year.

Project #26: Track Energy Use on Monthly Basis: Inform employees of use and track other buildings for comparison purposes. More detailed tracking can be accomplished with daily meter reading which is not part of this project. Savings can be $250-500 per year at a cost of $100-200.

Project #21: Utility Rebates: Several of the energy projects implemented may warrant a rebate from the utility companies. The projects that meet the requirements are #1, 2, 3, 7, 8, 13, 14, 16, 17, 18, 19, 20, 21 and 22. Savings will depend on the specific projects implemented and the type of equipment used.

BLOOMFIELD TOWNSHIP CABLE BUILDING TEA REPORT

The Cable Building is made up of offices, garages, and storage areas. In total this is a 4,300 square foot building. Annual energy costs total $19,069 with $15,644 for electricity and $3,425 for natural gas. The building energy consumption is at 221.9 KBTU/sq. ft. and the cost is $4.43/sq. ft. Similar office buildings national averages don't exist for this type building. An estimate of a like building shows a range EUI range of 124-160 KBTU/sq. fT., which shows the Cable Building has many opportunities. The electric portion is abnormally high, which is driven by all the TV related equipment and around the clock usage.

The Technical Energy Audit (TEA) includes: TEA Report and Recommendations, Appendix A: Potential Project Listing; Appendix B: Lighting Survey, TEA Audit Findings Summary Sheet with Energy Star Portfolio Manager, Natural Gas Consumption and Cost Report, and Electrical Consumption and Cost Report.

POTENTIAL PROJECTS

The Cable Building has 20 Energy Conservation Projects (ECM) which have been revealed in the Technical Energy Audit performed by the Avrie Group. Of these projects seventeen are recommended to be implemented, which can save between $5,315-10,130 per year. These savings are equal to 28-53% of the last year's annual energy costs for the building. The cost to implement these projects can range between $7,395 and $11,910. The return on investment ranges between 0.1 and 16.7 years.

Utility rebate incentives can be applied to ten of the recommended projects described later in this report although we recommend projects 1, 2, 5, 6, 8, 9, 11, 13, 14 and 15. Each incentive dollar amount will depend on the size of the units, efficiency, and other details of the equipment installed.

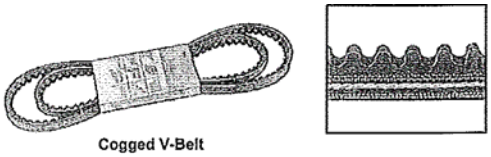
The list below shows the recommended projects to be implemented. Details of all the projects can be seen in Appendix A.

Project #	Project Name	Low Side Savings	High Side Savings	High Side Capital Costs	Years ROI
1	Use high efficiency motors	90	180	225	2.5
2	Use cog belts in motors driving belts to the load.	60	180	1,000	16.7
4	Use CO2 Controls in Studio	400	600	3,000	7.5
6	Install tamper proof set back thermostats	1,800	2,700	1,200	0.7
7	Thermostat set point to high 80 degrees in Sally Port	50	200	25	0.5
8	Hot water heating improvements	200	250	1,500	7.5
9	Reduce hot water use	20	40	200	10
11	Replace Parking Lot Lights	120	150	800	6.7
12	Trim trees around parking lot lights	Improved use			n/a
13	Occupancy sensors in 10 rooms	220	440	2,200	10
14	Replace exit lights with LED units	55	140	360	6.5
15	Purchased kitchen appliances that are Energy Star Products	Will depend on what is replaced			n/a
16	Employee Training	350	900	300	0.9
17	Purchase Natural Gas from another source	350	1,050	500	1.428571
18	Purchase electricity from another source than DTE	1,500	3,000	500	0.3
19	Track Energy Use on Monthly Basis	100	300	200	2.0
20	Utility rebates	Depending on which projects are implemented		Incentive rebates potential on projects #1,2,5,6,8,9,11, 13, 14, and15	n/a
	Total Proposed Projects (Either Project #5 or #6 can be implemented, the higher ROI project was cut)	**$5,315**	**$10,130**	**$11,910**	**2.2 years**

Details of Recommended Projects

Project #1: High Efficiency Motors: When replacing motors in the building purchase premium high efficiency motors. The energy savings are between 1-3.6% when compared to units in operation. The costs to purchase runs around $125/10 hp motor, the dollar savings can be $90-180/10 hp motor.

Project #2: Use Cogged Belts Versus Standard V-Belts on Motor Drive: A savings of 1-3% can be saved by using cog belts versus standard v-belts which most of the motors are operating with. Going forward all belt changes should be made with cogged belts. There is a premium for the belts which is repaid from energy savings.



Project #4: Use CO2 Controls in Studio HVAC: Studio HVAC unit has a variable frequency drive on it already. Install CO2 controls to adjust outside air makeup since the excess air in not needed. Design of the system includes over supply during many times of the day, which can be reduced using the CO2 controls and the variable speed drives. In a building this size it is usually not viable to do this, but since a major portion of the costs (variable drive) are already in place. Savings can be $400-600 per year. Costs can be $2,500-3,000 with a ROI of 7.5 years. This technology is proven and is used universally.

Project #6: Install Tamper Proof Set Back Thermostats: Thermostats are allowed to be controlled by anyone that pleases to make a change. A prescribed set point will be established and the unit will be run at scheduled times. If the EMS system is installed this will be included in that system. The studio already has a unit in operation, make sure it is set and not allowed to be adjusted by just anyone. Savings can be $1,800-2,700 per year, with a cost of $800-1,200. If this project is installed, the EMS project savings will be lowered significantly. Therefore, either Project #5 or #6 should be implemented, but not both.

Project #7: Thermostat Set Points: Set points should be lowered to 68-72 degrees in the Sally Port room, during the audit the set point was at 80 degrees f. Savings can be $50-200 per year, for a cost of $0-25.

Project #8: Replace Hot Water Heater: Install newer more efficient natural gas hot water heating system which replaces the electrical unit. Use one of the heaters that will be shut off in another Township building. The high cost will be if a new unit is purchased and installed.

Project #9: Reduce Hot Water Use: Install flow restriction nozzles on the bathroom and break room water faucets. Savings of between 10-20% can be realized with a small investment. There are rebates from the natural gas utility for this equipment.

Project #11: Replace Parking Lot Lights: Install Induction lighting, which will reduce the 250 watt fixtures to 120 watt units. Savings can be $120-150 per year for a cost of $650-800. The ROI can be 6.7 years.

Project #12: Trim Trees around Parking Lot Lights: Light is being blocked by the trees in the summer with the leaves. Trim the trees to let more of the light get to the targeted areas; there will be no direct energy savings, but improved use of the electricity used will be accomplished.

Project #13: Occupancy Sensors: Install occupancy sensors in all offices, conference rooms, bathrooms, and storage areas. The sensors will sense the movement of people and turn on the lights in the area around the sensor. If the sunlight provides enough background lighting the lights will not turn on. Savings will range between 20-60% depending on the area and use patterns. Savings can range between $220-440 per year. The implementation costs can be from $1,600-2,200 which will depend on the lighting circuits and the amount of units required.

Project #14: Replace Exit Lights with LED Units: There are three exit signs that use incandescent and or fluorescent lights. The bulb uses 20-50 watts per sign, versus 0.5-3 watts for new LED lights. Retrofit units can be installed, but for just a few dollars more a new unit can be purchased. The DTE rebate plan provides $12.50 per sign.

Project #15: Replace Break Room Appliances: On average most kitchen style equipment can be replaced, which can save between 10-20% in electricity. The savings is not large enough to justify replacement for that reason only. Although, make it policy to replace all freezers, refrigerators, dishwashers, stoves with Energy Star products.

Project #16: Employee Training: Provide training for all employees working in the building regarding energy use and costs. Many times employees make decisions to use energy, and do it without any idea of how their choices affect the consumption of energy. Typical savings can be thousands of dollars on 5% of the consumption. The savings for the Cable Building can range between $350-900 per year.

Project #17: Purchase Natural Gas from another Source: Natural gas can be purchased from brokers which sell natural gas at a discount, and savings can range between 10-30% of the rates being paid today. This can account for an estimated $350-1,050 per year.

Project #18: Purchase Electricity from another Source than DTE: Electricity can be purchased from brokers which sell electricity at a discount when compared to the utility DTE. There is a limited amount of KW that are allowed for this service in the entire DTE grid. Thus, at this time there is nothing to purchase, but is soon to change this fall. Savings can reach between $1,500-3,000 per year.

Project #20: Track Energy Use on Monthly Basis: Inform employees of use and track versus other buildings for comparison purposes. More detailed tracking can be accomplished with daily meter reading which is not part of this project. The savings can be $100-300, with a cost of $100-200. The ROI can be 0.5 years.

Project #20: Utility Rebates: Several of the energy projects implemented may be warrant a rebate from the utility companies. Incentive rebates on potential on projects #1, 2, 5, 6, 8, 9, 11, 13, 14 and 15. The amount of the rebates will depend on the particular projects implemented. There is a limited amount of money for these projects, thus the rebates are not guaranteed.

BLOOMFIELD TOWNSHIP DISTRICT COURT TEA REPORT

The District Court is made up of offices, judge's chambers, court rooms, jury rooms, bathrooms, large meeting rooms, and storage areas. In total there is 33,489 square feet in the building. Annual energy costs total $80,481 with $61,481 for electricity and $19,000 for natural gas. The building energy consumption is 115 KBTU/sq. ft. and the cost is $2.40/sq. ft. The average for a similar building in an identical climate is 89 KBTU/sq. ft. depending on many variables, such as size, floors, and year built, etc. When compared to other buildings, there is room for improvement in this particular building.

The Technical Energy Audit (TEA) includes: TEA Report & Recommendations, Appendix A: Potential Project Listing, Appendix B: Lighting Survey, TEA Audit Findings Summary Sheet with Energy Star Portfolio Manager, Natural Gas Consumption & Cost Report, and Electrical Consumption & Cost Report.

POTENTIAL PROJECTS

The District Court has 21 Energy Conservation Projects (ECP) which have been revealed in the Technical Energy Audit performed by the Avrie Group. Seventeen (17) projects are recommended for implementation, which will save between $22,230-44,956 per year. These savings are equal to 28-57% of the last year's annual energy costs for the building. The cost to implement these projects will range between $36,475-57,600. The return on investment is 0.1 to 12.2 years.

Utility rebate incentives can be applied to 13 of the recommended projects (1, 2, 3, 4, 5, 7, 9, 10, 11, 12, 13, 14, 15). Each incentive dollar amount will depend on the size of the units, efficiency, and other details of the equipment installed.

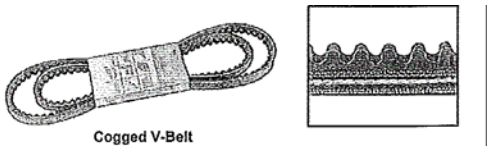
The list below shows the recommended projects to be implemented. Details of all of the projects can be seen in Appendix A.

Proj. #	Project Name	Low side savings	High Side Savings	High Side Costs to Implement	Years ROI
1	Use high efficiency motors	90	180	125	1.4
2	Use cog belts	600	1,800	1,000	1.7
3	Replace Roof Top HVAC unit with more efficient unit	1,650	4,200	16,000	9.7
4	Replace Bryan boilers	3,150	4,500	25,000	7.9
7	Install tamper proof thermostats	7,000	14,000	3,500	0.5
10	Reduce Hot Water Use	30	60	200	6.7
11	Occupancy sensors	640	1,920	7,800	12.2
12	Exit signs replaced with LED units	220	560	1,440	6.5
13	Drinking Fountain Timers	30	36	35	1.2
14	Replace Toilets with low water use units	Water savings			
15	Vending Machines	420	700	800	1.9
16	Kitchen appliances Energy Star	Will depend on what is installed			
17	Employee training	350	900	500	1.4
18	Purchase Natural Gas from another source	1,700	3,400	500	0.3
19	Purchase electricity from another source than DTE	6,100	12,200	500	0.1
20	Track Energy Use on Monthly Basis	250	500	200	0.8
21	Utility Rebates	Will depend on which projects are installed			
	Totals for all projects	**$22,230**	**$44,956**	**$57,600**	**2.6 years**

Details of Recommended Projects

Project #1: High Efficiency Motors - When replacing motors in the building, it is recommended to purchase premium high efficiency motors. The energy savings are between 1-3.6% when compared to units in operation. The costs to purchase runs around $125/10 hp motor. Dollar savings will be $90-180/10 hp motor.

Project #2: Use Cogged Belts Versus Standard V-Belts on Motor Drives – There can be a savings of 1-3% by using cog



belts versus standard v-belts, currently being utilized. Going forward, all belt changes should be made with cogged belts. There is a premium for the belts, which is repaid from energy savings.

Project #3: Replace Roof Top HVAC Units - The roof top units can be replaced with higher efficiency SEER units. This will save 10-30% of energy consumed on the cooling side and 5-10% on the heating side. Savings can be $1,650-4,200 per year, with an expense of $9,000-16,000.

Project #4: Replace Bryan Boilers - Replace Bryan boilers, 1988 run at 60-75% efficiency, and replace with 90+% units. Savings can be $3,150-4,500 for a cost of $17,000-25,000. The ROI will be 7.9 years.

Project #7: Install Tamper Proof Password Protected Set Back Thermostats - Thermostats are allowed to be controlled by anyone that pleases to make a change. A prescribed set point can be established and the unit can be run at scheduled times. If the EMS system is installed, this can be included in the system. Ten (10) different zones will have to be modified. Savings can be significant for the whole building at $7,000-14,000 per year.

Project #10: Reduce Hot Water Use - Install devices in bathroom and other faucets to reduce the use of hot water. A 10-20% reduction should be realized. The costs savings can be $30-60 for a cost of $3,000-4,500.

Project #11: Occupancy Sensor - Install in offices, basement, storage rooms, courtrooms, and associated rooms. Savings of 20-60% is typical. Savings can range between $640-1,920 per year, savings are higher than the large garage since all the lights are left on versus half like the large garage. The cost to install will be $5,200-7,800.

Project #12: Replace Exit lights with LED Units - The existing exit signs use 20-50 watts per unit more than a new LED unit will. Twelve (12) signs will be replaced. The savings can be $220-560 per year.

Project #13: Drinking Fountain Timer - Install timers on drinking fountains, so during the off-times when the facility is closed, the units turn off. The cooling done during this time wastes electricity. Four units can utilize these timers.

Project #14: Replace Toilets with Low Water Use Units - The present units use 3.6 gallons per flush, versus 1.6 gpf for new style units which amounts to a savings of 55%. There will be no direct energy savings, the only site savings will be water.

Project #15: Vending Machine Controls- Minimize energy use of vending machines, install devices which will cut back consumption during scheduled off-periods. Reduce lighting in units. Have vendors replace with high efficiency units. Two vending machines can utilize a control device to obtain these savings. Savings can be $420-700 per year with a cost of $600-800.

Project #16: Replace Break Room Appliances - The building does not have Energy Star products in the break room. On average, most kitchen equipment can be replaced, which can save 10-20% in electricity. The savings is not large enough to justify replacement for

that reason only. Make it a policy to replace all appliances with Energy Star products.

Project #17: Employee Training - Provide training for all employees working in the building regarding energy use and costs. Employees make decisions on energy use without knowledge of energy consumption. Typical savings can be thousands of dollars – up to 5% of the consumption. Savings in the District Court can be $350-900 per year, for a cost of $150-500.

Project #18: Purchase Natural Gas from another Source. Natural gas can be purchased from brokers, which sell natural gas at a discount when compared to the utility rates. Savings can range between $1,700-3,400 per year. This can cost $0-500 to implement.

Project #19: Purchase Electricity from another Source other than DTE. Electricity can be purchased from brokers, which sell electricity at a discount when compared to the utility DTE. There is a limited amount of KW allowed for this service in the entire DTE grid. Thus, at this time there is none available to be purchased, but will change this fall. Savings can reach between $6,100-12,200 per year.

Project #20: Track Energy Use on Monthly Basis - Inform employees of use and track versus other buildings for comparison purposes. More detailed tracking can be accomplished with daily meter readings, which is not part of this project. Savings can be $250-500 per year at a cost of $100-200.

Project #21: Utility Rebates - Several of the energy projects implemented may warrant a rebate from the utilities. The projects that meet the requirements are #1, 2, 3, 4, 7, 9, 10, 11, 12, 13, 14, 15 & 16. Savings will depend on the specific projects implemented and the type of equipment used.

BLOOMFIELD TOWNSHIP ANIMAL SHELTER TEA REPORT

The Animal Shelter is made up of offices, garages, animal cages, wash area, food storage, and storage areas. In total this is a 4,200 square foot building. Annual energy costs total $9,938 with $2,135 for electricity and $7,803 for natural gas. The building energy consumption is at 202.7 KBTU/sq. ft. and the cost is $2.11/sq. ft. Similar office buildings national averages do not exist for this type building. An estimate of like building show a range EUI range of 95-120 KBTU/sq. ft. which shows the Animal Shelter has many opportunities.

The Technical Energy Audit (TEA) includes: TEA Report and Recommendations, Appendix A: Potential Project Listing; Appendix B: Lighting Survey, TEA Audit Findings Summary Sheet with Energy Star Portfolio Manager, Natural Gas Consumption and Cost Report, and Electrical Consumption and Cost Report.

POTENTIAL PROJECTS

The Animal Shelter Building has sixteen Energy Conservation Projects (ECP) which have been revealed in the Technical Energy Audit performed by the Avrie Group. Of these projects thirteen are recommended to be implemented which can save between $2,150-5,141 per year. These savings are equal to 22-52% of the last year's annual energy costs for the building. The cost to implement these projects can range between $2,390-6,610, the return on investment is 0.1-21.4 years.

Utility rebate incentives can be applied to eight of the recommended projects described later in this report, although we recommend projects 1, 2, 4, 5, 7, 9, 10 and 11. Each incentive dollar amount will depend on the size of the units, efficiency, and other details of the equipment installed.

The list below shows the recommended projects to be implemented. Details of all the projects can be seen in Appendix A.

Project #	Project Name	Low Side Savings	High Side Savings	High Side Capital Costs	Years ROI
2	Install tamper proof set back thermostats	700	1,400	1,200	1.7
3	Thermostat set point to high, lower to 68-72	300	450	25	0.1
4	Replace Hot water heater	70	105	1,500	21.4
5	Reduce hot water use	35	70	200	5.7
7	Exterior Lighting Timers	60	100	500	8.3
9	Replace Exit sign with LED units	90	230	600	6.7
10	Drinking Fountain timer	30	36	35	1.2
11	Replace appliance with Energy Star products	Will depend on which appliances replaced			n/a
12	Employee training	40	80	150	3.8
13	Purchase Natural Gas from another source	700	2,100	500	0.7
14	Purchase electricity from another source than DTE	100	300	500	5.0
15	Track Energy Use on Monthly Basis	25	50	200	8.0
16	Utility rebates	Will depend on what is replaced			n/a
	Total Proposed Projects (Either Projects #1 or #2 can be implemented, the higher ROI project was cut)	**$2,150**	**$5,141**	**$6,610**	**3.1 years**

Details of Recommended Projects

Project #2: Install Tamper Proof and Password Protected Set Back Thermostats: Thermostats are allowed to be controlled by anyone that pleases to make a change. A prescribed set point of 68-70 degrees in the winter and 74-76 degrees in summer will be established and the unit will be run at scheduled

times. If the EMS system is installed this will be included in that system. The kennel and garage areas are not cooled in the summer and will continue to be so. Savings can be $700-1,400 per year with a cost of $600-1,200. If this project is installed, the EMS project savings will be lowered significantly, therefore, either Project #1 or #2 should be implemented, but not both.

Project #3: Thermostat Set Points: Set points should be lowered to 68-72 degrees the actual temperatures in offices, bathrooms, and lobby area ranged between 70-76.7 degrees F. Savings can be $300-450 per year for a cost of $0-25.

Project #4: Replace Hot Water Heater: Install newer more efficient natural gas hot water heating system which would replace the electrical unit. Hot water is used to clean cages and animals, which causes the use to be higher than other buildings of same size. Use one of the heaters that will be shut off in another Township building. The higher cost is assuming a new unit is purchased and installed.

Project #5: Reduce Hot Water Use: Install flow restriction shower nozzles and add automatic faucet controls. Savings of between 10-20% can be realized with a small investment. There are rebates from the natural gas utility for this equipment.

Project #7: Exterior Building lighting timers: Exterior building lights are left on during the day and should be shut off with an automatic timer. Lights where on during daylight hours on all four visits to the building during the audits.

Project #9: Replace Exit Lights with LED Units: There are five signs that use incandescent and/or fluorescent lights. The bulb uses from 20-50 watts per sign versus 0.5-3 watts for the new LED lights. Retrofit units can be installed, but for just a few dollars more a new unit can be purchased. The DTE rebate plan provides $12.50 per sign.

Project #10: Drinking Fountain Timers: The drinking fountain cools water 24 hours 365 days a year, which is not needed. Install a timer which will allow the unit to run during business hours only. The savings can be $30-36 per year for the cost of $20-35 per plug-in timer.

Project #11: Replace Kitchen and Break Room Appliances: On average most kitchen equipment can be replaced, which can save between 10-20% in electricity. The savings is not large enough to justify replacement for that reason only. Although, make it policy to replace all freezers, refrigerators, with Energy Star products.

Project #12: Employee Training: Provide training for all employees working in the building regarding energy use and costs. Many times employees make decisions to use energy and do it without any idea of how their choices affect the consumption of energy. Typical savings can be thousands of dollars on 5% of the consumption. The savings for the Cable building can range between $40-80 per year.

Project #13: Purchase Natural Gas from another Source: Natural gas can be purchased from brokers which sell natural gas at a discount and savings can range between 10-30% of the rates being paid today. This can account for an estimated $700-2,100 per year.

Project #14: Purchase Electricity from another Source than DTE: Electricity can be purchased from brokers which sells electricity at a discount when compared to the utility DTE. There is a limited amount of KW that are allowed for this service in the entire DTE grid. Thus, at this time there is nothing to purchase, but is soon to change this fall. Savings can reach between $100-300 per year.

Project #15: Track Energy Use on Monthly Basis: Inform employees of use and track other buildings for comparison purposes. More detailed tracking can be accomplished with daily meter reading which is not part of this project. The savings can be $25-50 with a cost of $100-200. The ROI can be 8.0 years.

Project #16: Utility Rebates: Several of the energy projects implemented may be warrant a rebate from utility companies. Incentive rebates on potential on projects #1, 2, 4, 5, 7, 9, 10 and 11. The amount of the rebates will depend on the particular projects implemented. There is a limited amount of money for these projects, thus the rebates are not guaranteed.

BLOOMFIELD TOWNSHIP
PUBLIC SERVICES BUILDING TEA REPORT

The Public Services building is made up of offices, garages, basement, firing range, and storage. In total this is a 77,757 square foot building. Annual energy costs total $119,471.42 with $87,455.54 for electricity and $32,015.88 for natural gas. The building energy consumption is 75.1 KBTU/sq. ft. and the cost is $1.53/sq. ft.

Building data has been entered into Energy Star Portfolio Manager, which helps provide many evaluations of the energy use. The Energy Star Rating is 15 versus 37 for benchmark buildings of similar use and geographic location. Energy Star Ratings of 75 are the minimum for becoming an Energy Star Building. Thus, this building is not close to being an Energy Star building without significant changes and upgrades.

The Technical Energy Audit (TEA) includes: TEA Report and Recommendations, Appendix A: Potential Project Listing; Appendix B: Lighting Survey, TEA Audit Findings Summary Sheet with Energy Star Portfolio Manager, Natural Gas Consumption and Cost Report, Electrical Consumption and Cost Report.

POTENTIAL PROJECTS

The PSB has 20 Energy Conservation Projects (ECP) which have been revealed in the Technical Energy Audit performed by the Avrie Group. Of these projects 18 are recommended to be implemented, which will save between $15,460 and $44,350 per year. These savings are equal to 13-37% of the last year's annual energy costs for the building. The cost to implement these projects will range between $12,400 and $27,700. The return on investment average for all the projects on the low side of savings is 0.8 years. The ROI for the high side of the savings is 0.65 years.

The projects recommended are all low cost or no cost (under $5,000 to implement).

Utility rebate incentives can be applied to 4 of the recommended projects (9, 10, 11, & 16). Each incentive dollar mount will depend on the size of the units; efficiency; and other details of the equipment installed.

The list below shows the recommended projects to be implemented. Details of all the projects can be seen in Appendix A.

Proj. #	Project Name	Low side savings	High Side Savings	High Side Costs to Implement	Years ROI
1	Tune Up EMS Systems	1,000	4,000	1,500	1.5
2	Automatic air curtain on garage doors	800	1,200	4,500	5.6
3	Exterior door kept closed during heating periods	500	3,000	3,000	6.0
4	Reduce static pressure for building	0	3,000	2,000	0
5	Heating thermostat set point, lowered	0	2,000	1,000	0
6	Air Conditioning Thermostat Set Points, raised	500	2,000	1,500	1.3
7	Shut off one of #304 water heaters	70	90	0	0
8	Shut off one of the locker room heaters	90	110	0	0
9	Automatic light controls DPW garage	600	800	4,000	6.7
10	Water storage parts room automatic light sensors	500	700	1,500	3.0
11	Parts storage room lighting automatic sensor	400	600	1,000	2.5
12	Mechanical room lighting automatic sensors	200	300	500	2.5
13	Purchase electricity during off-peak hours morning hours	0	1,500	1,000	0.7
15	Vending Machines automatic controls	800	1050	1,200	1.5
17	Employee training	1,000	3,000	1,500	1.5
18	Purchase Natural Gas from another source	2,000	4,000	1,500	0.8
19	Purchase electricity from another source than DTE	7,500	15,000	2,000	0.3
20	Utility Rebates	Will Depend	Will Depend	Will Depend	Will Depend
	Totals for all projects	**15,460**	**42,350**	**12,400**	**27,700**

Details of Recommended Projects

Project #1: Tune up EMS systems: The EMS systems where set up with the specifications from the building designs, which needs to be customized to the actual building. Many reactions to set points, control methods, air flows, etc. needs to be adjusted to the actual conditions. This will allow for savings in some situations and others there will not be any savings. Estimates are between $1,000-4,000 per year can be trimmed in the electrical and natural gas costs. The costs will be $1,000-1,500 to implement the adjustments and changes.

Project #2: Install Automatic Door Air Shields: Install air shield fans which can reduce the heat losses during period when the heat is on and the large doors are open. The fans are high velocity and will make an air curtain which will keep air losses to a minimum. At present the large garage when open let heated air out the doors which wastes heated air. The air curtain will save $800-1,200 per year.

Project #3: Keep Exterior Door Closed during Heating Season: Many times during the audit the exterior doors, man doors, as well as the garage doors in the work bays where left open. Heating systems where on and running hard to try to keep the rooms temperature where they were set. During the transition months the temperatures need to be lowered if the doors are going to be opened, and if not the doors must be kept closed. This is an employee issue and some training will help. If training is not enough the supervisors in the areas must be held accountable to follow up on this issue.

Project #4: Reduce Static Air Pressure of the Building: The static is 1.3 inches with 550-600 PPM CO_2, both of which can be adjusted to lower the supply of new fresh air. The supply fan can be slowed down and the economizer can re-use more return air. This can be adjusted in the EMS to obtain the savings. This can be a significant savings between $0-3,000 per year. The project cost is not for equipment but for the adjustments to the EMS controls.

Project #5: Heating Thermostat Set Points: Set points should be lowered, between 68-71 degrees F. Several times the temperature set points are set higher. The township should consider a range which is SOP for all building depending on if it is an office, garage, etc. The offices should run 68-71 while the garages can be set at 65-68 degrees, and can save electrical and natural gas costs between $0,-2,000 per year.

Project #6: Air Conditioning Thermostat Set Points: Set points should be raised. The offices should be operated at 74-76 degrees F, while garages are not air conditioned, basements should be 74-76 degrees F. This is higher than typical in the township. A SOP should be put into place that allows the maintenance group to refer to, and therefore all employees will know what it is.

Project #7: Shut Off One of #340 Water Heaters: There are two water heaters for the kitchen and bathrooms. These water heaters are 65 gallon units which are large enough to service the connected faucets utilizing just one of the units. The 65 gallon unit is larger than needed by itself. The standby energy losses are 680 btu/hr which is all a waste.

Project #8: Shut Off One of the Water Heaters for the Locker Rooms: There are two 100 gallon water heaters. Only one of the two is required. If one is turned off, such as in Project #7, energy will be saved with the shut off. The energy wasted is 1040 btu/hr, and the costs saved will be between $90-110 per year.

Project #9: Automatic Light Controls in DPW Garage: The DPW garage lights are left on all day long whether they are needed or not. Automatic controls can be installed which will provide the control systems to shut the lights off when not in use. The room's skylights and many windows also allow s natural sunlight into the room, which will save between $600-800 per year in lighting costs.

Project #10: Water Storage Parts Room Automatic Light Sensors: The storage room lights are left on over 80% of the time when not in use. The room has skylights, which is enough to walk in the room safely. The room lights can be split into zones, which will allow only the lights required to be turned on. Automatic controls sensors can be installed to save wasted electricity. Savings will be between $500-700 per year.

Project #11: Parts Storage Room Lighting Automatic Sensors: The lights are operating all day long when they are not needed. The lights should be controlled with sensors to allow the lights just by the desk to operate, and then the others by the part bins and racks should be operated through separate sensors. This will save between $400-600 per year.

Project #12: Mechanical Room Lighting Automatic Control Sensors: The mechanical room lights are on 80% of the time when un-occupied. Automatic sensors will allow the lights to be shut off when not in use. This will save $200-300 per year.

Project #13: Purchase Electricity during Off Peak Morning Hours: Start up the systems early to take advantage of the off-peak hours. There may be some benefit, but the systems must be tested to see if

this works for this location. It would most likely work best in the office where it is air conditioned. There may not be any savings, but should be monitored and followed to see if benefits will be reaped.

Project #15: Vending Machine Set Back Controls: Vending machines keep the lights on and keep products cool 24/7 which is not necessary. Pop and other beverages do not need to be kept cool 24/7 especially in evening hours when no one is working in the building. Also, ensure that vendors supply the highest efficient units. Lights on units can be turned off; they do not need to be on. These vending machines sometimes use 50 watts, 8,760 hours per year. There are three units at the PSB which could have controls added to the plug allowing the machine to shut down when not in service.

Project #17: Employee Training: Provide training for all employees working in the building regarding energy use and costs. Many times employees make decisions to use energy and do it without any idea how their choices affect the consumption of energy. Typical savings can be thousands of dollars to 5% of the consumption.

Project #18: Purchase Natural Gas from another Source: Natural gas can be purchased from brokers which sell natural gas at a discount when compared to the utility rates. Savings can range between 20-40% of the rates being paid today. This will account for $2,000-4,000 per year.

Project #19: Purchase Electricity from another Source than DTE: Electricity can be purchased from brokers, which sell electricity at a discount when compared to the utility DTE. There is a limited amount of KW that are allowed for this service in the entire DTE grid. Thus, at this time there is nothing to purchase, but is soon to change this fall. Savings can reach between $7,500-15,000 per year.

Project #20: Utility Rebates: Several of the energy projects implemented may be warrant a rebate from the utilities. The projects that meet the requirements are projects 9, 10, 11 and 16. Savings will depend on the specific projects implemented and the type of equipment used.

BLOOMFIELD TOWNSHIP
PUBLIC SERVICES ANNEX BUILDING TEA REPORT

The Public Services Annex Building is made up of offices, three (3) garages, locker rooms, bathrooms, and storage. In total there is 11,586 square feet in the building. Annual energy costs total $26,618 with $21,383 for electricity and $5,235 for natural gas. The building energy consumption is 100.4 KBTU/sq. ft. and the cost is $2.30/sq. ft. The average for a similar building in identical climate is 84.6 KBTU/sq. ft., which shows there is room for improvement in this building.

The building has an elaborate EMS system, efficient lighting, and is well insulated, but more can be implemented.

The Technical Energy Audit (TEA) includes: TEA Report & Recommendations, Appendix A: Potential Project Listing, Appendix B: Lighting Survey, TEA Audit Findings Summary Sheet with Energy Star Portfolio Manager, Natural Gas Consumption & Cost Report, and Electrical Consumption & Cost Report.

POTENTIAL PROJECTS

The PS Annex has 10 Energy Conservation Projects (ECP) which have been revealed in the Technical Energy Audit performed by the Avrie Group. All 10 are recommended to be implemented, which will save between $3,615-8,040 per year. These savings are equal to 14-30% of the last year's annual energy costs for the building. The cost to implement these projects will range between $1,750-4,000. The return on investment is 0.6-7.6 years.

Utility rebate incentives can be applied to 4 of the recommended projects (3, 4, 5). Each incentive dollar mount will depend on the size of the units; efficiency; and other details of the equipment installed.

The list below shows the recommended projects to be implemented. Details of all the projects can be seen in Appendix A.

Proj. #	Project Name	Low side savings	High Side Savings	High Side Costs to Implement	YEARS ROI
1	Tune Up EMS Systems	800	1,000	800	1.0
2	Shut off one of locker room water heaters, can use in another building.	90	110	50	0.6
3	Occupancy sensor in large garage	110	260	800	7.3
4	Occupancy sensors in middle garage	180	420	500	2.8
5	Occupancy sensors in west garage	85	250	500	5.9
6	Employee training	250	500	150	0.6
7	Purchase Natural Gas from another source	500	1,500	500	1.0
8	Purchase electricity from another source than DTE	1,500	3,000	500	0.3
9	Track Energy Use on Monthly Basis	100	300	200	2.0
10	Utility Rebates	Will depend		Projects, 3,4,5	
	Totals for all projects	**3,615**	**8,040**	**4,000**	**1.1 years**

Details of Recommended Projects

Project #1: Tune Up EMS Systems. The EMS systems where set up with the specifications from the building designs, which need to be done now customized to the actual building. Many reactions to set points, control methods, air flows, and etc need to be adjusted to actual conditions. This will allow for savings in some situations and others there will not be any savings. Estimates are that between $800-1,000 per year can be trimmed in the electrical and natural gas costs. The costs will be $200-800 to implement the adjustments and changes.

Project #2: Shut Off One Locker Room Water Heater. Shut off one of the water heaters for the locker rooms: There are two 100 gallon water heaters. Only one of the two is required. The second unit can be shut off or moved to another location. These are high efficient units, which would be good in other locations in the township. Energy wasted is 1040 btu/hr. The costs saved will be between $90-110 per year.

Project #3: Automatic Light Controls East Garage. Half the lights are left on all day long whether they are needed or not. Automatic controls can be installed, which will provide the control systems to shut the lights off when they are not needed. The large door provides enough light to see when opened. Savings will range between $110-260 per year, with an installed cost of $600-800.

Project #4: Automatic Light Controls Middle Garage. The lights are left on all day long whether they are needed or not. Automatic controls can be installed, which will provide the control systems to shut the lights off when they are not needed. The large door provides enough light to see when opened. Savings

will range between $180-420 per year, savings are higher than the large garage since all the lights are left on versus half like the large garage. The cost to install will be $400-500.

Project #5: Automatic Light Controls West Small Garage. The lights are left on all day long whether they are needed or not. Automatic controls can be installed, which will provide the control systems to shut the lights off when they are not needed. The large door provides enough light to see when opened. Savings will range between $180-420 per year. The cost to install will be $400-500.

Project #6: Employee Training- Provide training for all employees working in the building regarding energy use and costs. Many times employees make decisions to use energy and do it without any idea how their choices affect the consumption of energy. Typical savings can be thousands of dollars to 5% of the consumption. Savings in the PS Annex will be $250-500 per year, for a cost of $50-150.

Project #7: Purchase Natural Gas from Another Source. Natural gas can be purchased from brokers, which sell natural gas at a discount when compared to the utility rates. Savings can range between 20-40% of the rates being paid today. This will account for $500-1,500 per year.

Project #8: Purchase Electricity from Another Source than DTE. Electricity can be purchased from brokers, which sell electricity at a discount when compared to the utility DTE. There is a limited amount of KW that are allowed for this service in the entire DTE grid. Thus, at this time there is no available to be purchased, but that is soon to change this fall. Savings can reach between $1,500-3,000 per year.

Project #9: Track Energy Use on Monthly Basis- Inform employees of use and track versus other buildings for comparison purposes. More detailed tracking can be accomplished with daily meter reading, which is not part of this project. Savings will be $100-300 per year at a cost of $100-200.

Project #10: Utility Rebates. Several of the energy projects implemented may warrant a rebate from the utilities. The projects that meet the requirements are #3, 4, and 5. Savings will depend on the specific projects implemented and the type of equipment used.

BLOOMFIELD TOWNSHIP CENTRAL FIRE STATION TEA REPORT

The Central Fire Station building is made up of the apparatus room, garage, living quarters, control room, locker room and storage areas. In total this is a 17,095 square foot building. Annual energy costs total $32,109 with $22,801 for electricity and $9,308 for natural gas. The building energy consumption is 100.4 KBTU/sq. ft. and the cost is $1.88/sq. ft., similar buildings in the same type climate average 107.4 KBTU/sq. ft. This shows that the Central Fire Station is doing better than the national average, but there are still some opportunities for improvement.

The Technical Energy Audit (TEA) includes: TEA Report and Recommendations, Appendix A: Potential Project Listing, Appendix B: Lighting Survey, TEA Audit Findings Summary Sheet with Energy Star Portfolio Manager, Natural Gas Consumption and Cost Report, and the Electrical Consumption & Cost Report.

POTENTIAL PROJECTS

The Central Fire Station has 13 Energy Conservation Projects (ECP) which have been revealed in the Technical Energy Audit performed by the Avrie Group. Of these projects 12 are recommended to be implemented, which can save an estimated $5,210-11,457 per year. These savings are equal to 16-36% of the last year's annual energy costs for the building. The cost to implement these projects can range between $2,600-6,365, and the return on investment ranges between 0.2 and 10 years.

Utility rebate incentives can be applied to four of the recommended projects described later in this report; although, we recommend projects 5, 6, 7 and 8. Each incentive dollar amount will depend on the size of the units, efficiency, and other details of the equipment installed.

The list below shows the recommended projects to be implemented. Details of all the projects can be seen in Appendix A.

Project #	Project Name	Low Side Savings	High Side Savings	High Side Capital Costs	Years ROI
1	Tune up EMS systems	300	900	800	2.7
2	Lower heating season temperatures to 68-72.	400	800	500	1.3
3	Run AC temperatures at 74-76 degrees.	800	1,200	500	0.6
5	Reduce hot water use	20	40	200	10.0
6	Occupancy sensors in 13 rooms	330	1,000	2,900	8.8
7	Drinking fountain timers in office areas.	60	77	65	1.1
8	Purchased kitchen appliances that are Energy Star products	Will depend on what is replaced			n/a
9	Employee Training	150	300	500	3.3
10	Purchase Natural Gas from another source	900	2,700	500	0.6
11	Purchase electricity from another source than DTE	2,200	4,400	500	0.2
12	Track energy use on monthly basis	100	200	200	2.0
13	Utility rebates	Depending on which projects are implemented		Incentive rebates on potential projects items 5, 6, 7, 8	n/a
	Total Proposed Project	**5,210**	**11,457**	**6,365**	**1.2 years**

Details of Recommended Projects

Project #1: Tune up EMS Systems: The present system has a great deal of potential for controlling many aspects of the HVAC operations. The unit has not been adjusted beyond the building design specifications. Improvements can be made in fine tuning the start ups, allowing shut down periods, air flows, etc. Savings can be from $300-900 per year for a cost of $200-800.

Project #2: Thermostat Set Points- Set points should be lowered to 68-72 degrees. Actual temperatures in offices, bathrooms, bunk room, training area, and lobby are all higher and ranged between 71-76.7 degrees F. Savings can be $400-800 per year for a cost of $100-500.

Project #3: Run AC Cooling Temperatures at a Higher Level: Set AC cooling temperatures to 74-76 degrees. Many temperature readings during the audit where in the 60's which are way low. ASHRAE recommends temperatures for this type of building be at 74-76 degrees. Savings can be $800-1,200 per years, but additional cost may be needed to complete this project estimated at $100-500.

Project #5: Reduce Hot Water Use: Install devices in bathroom and other faucets reducing the use of hot water. A 5-10% reduction should be realized, and savings can be $20-40 per year for an initial investment of $100-200.

Project #6: Occupancy Sensors: Install occupancy sensors in 11 rooms, all offices, apparatus room, locker room, living quarters, bathrooms, and storage areas. The sensors will sense the movement of people and turn on the lights in the area around the sensor. If the sunlight provides enough background lighting the lights will not turn on. Savings can range between 20-60% depending on the area and use patterns, and savings can range between $280-840 per year. The implementation costs can be from $1,800-2,600 which can depend on the lighting circuits and the amount of units required.

Project #7: Drinking Fountain Timers: Install timers on the drinking fountains in the office areas. Install timers on drinking fountains, so that during times the facility is closed the units turn off. The cooling done during this time is wasted electricity. There are two units that can utilize these timers in the office.

Project #8: Replace kitchen and break room appliances: The building has an energy star refrigerator, stove, dishwasher, dryer, clothes washer, etc. On average most kitchen equipment can be replaced, which can save between 10-20% in electricity. The savings is not large enough to justify replacement for that reason only. Although, make it policy to replace all aolder freezers, refrigerators, dish washers, and stoves with Energy Star products.

Project #9: Employee Training: Provide training for all employees working in the building regarding energy use and costs. Many times employees make decisions to use energy, and do it without any idea of how their choices affect the consumption of energy. The lights where left on and no one was in the facility, and windows were open and AC was working to maintain temperatures. Typical savings can be thousands of dollars on 5% of the consumption. The savings for the Central Fire Station building can range between $150-300 per year.

Project #10: Purchase Natural Gas from another Source: Natural gas can be purchased from brokers who sell natural gas at a discount, and savings can range between 10-30% of the rates being paid today. This can account for an estimated $900-2,700 per year in savings.

Project #11: Purchase Electricity from Another Source than DTE: Electricity can be purchased from brokers, which sell electricity at a discount when compared to the utility DTE. There is a limited amount

of KW that are allowed for this service in the entire DTE grid. Thus, at this time, there is nothing available to purchase, but is soon to change this fall. Savings can reach between $2,200-4,400 per year.

Project #12: Track Energy Use on Monthly Basis: Inform employees of use and track other buildings for comparison purposes. More detailed tracking can be accomplished with daily meter reading which is not part of this project. The savings can be $100-200 with a cost of $100-200.

Project #13: Utility Rebates: Several of the energy projects implemented may warrant a rebate from the utility companies. Incentive rebates on potential projects are No. 5, 6, 7, and 8. The amount of the rebates will depend on the particular projects implemented. There is a limited amount of money for these projects, thus the rebates are not guaranteed.

BLOOMFIELD TOWNSHIP #2 FIRE STATION TEA REPORT

The #2 Fire Station building is made up of an apparatus room, garage, living quarters, control room, locker room, and storage areas. In total this is a 5,894 square foot building. Annual energy costs total $9,919 with $5,894 for electricity and $4,024 for natural gas. The building energy consumption is at 135.3 KBTU/sq. ft. and the cost is $2.25/sq. ft. Similar buildings average 77 KBTU/sq. ft.

This building equipment is in good shape, and most of the building is very energy efficient. Lighting has been upgraded to T8 bulbs, HVAC units are 13.5 SEER units, appliances are Energy Star, and toilets have low water use units. The opportunities for efficiency are few, but there are still some good opportunities.

High efficient unit at #2 Fire Station.

The Technical Energy Audit (TEA) includes: TEA Report and Recommendations, Appendix A: Potential Project Listing; Appendix B: Lighting Survey, TEA Audit Findings Summary Sheet with Energy Star Portfolio Manager, Natural Gas Consumption and Cost Report, and Electrical Consumption and Cost Report.

POTENTIAL PROJECTS

The #2 Fire Station has 12 Energy Conservation Projects (ECP) which have been revealed in the Technical Energy Audit performed by the Avrie Group. Of these projects eleven are recommended to be implemented, which can save between $1.875-4,510 per year. These savings are equal to 19-45% of the last year's annual energy costs for the building. The cost to implement these projects can range between $3,520-7,160, and the return on investment ranges between 0.9 and 17 years.

Utility rebate incentives can be applied to seven of the recommended projects described later in this report although we recommend projects 1, 2, 3, 4, 5, and 7. Each incentive dollar amounts will depend on the size of the units, efficiency, and other important details of the equipment installed.

The list below shows the recommended projects to be implemented. Details of all the projects can be seen in Appendix A.

Project #	Project Name	Low Side Savings	High Side Savings	High Side Capital Costs	Years ROI
2	Install tamper proof set back thermostats	450	900	1,200	2.7
3	Hot water heating improvements	60	90	1,500	25
4	Reduce hot water use	25	50	200	8.0
5	Occupancy sensors in 11 rooms	350	900	2,400	8.0
6	Replace exit lights with LED units	0	140	360	2.6
7	Purchased kitchen appliances that are Energy Star products	Will depend on what is replaced			n/a
8	Employee Training	90	180	300	3.3
9	Purchase Natural Gas from another source	350	1,050	500	1.4
10	Purchase electricity from another source than DTE	550	1,100	500	0.9
11	Track Energy Use on Monthly Basis	50	100	200	4.0
12	Utility rebates	Depending on which projects are implemented		Incentive rebates on potential projects items # 1,2, 3, 4, 5, 6, 7	n/a
	Total Proposed Projects (Either Project #1 or #2 can be implemented, the higher ROI project was cut)	**1,875**	**4,510**	**7,160**	**3.8 years**

Details of Recommended Projects

Project #2: Install Tamper Proof with Password Protected Set Back Thermostats: Thermostats are allowed to be controlled by anyone that pleases to make a change. A prescribed set point will be established and the unit will be run at scheduled times. If the EMS system is installed this will be included in that system. Savings can be $1,250-1,600 per year with a cost of $600-1,200. If this project is installed, the EMS project savings will be lowered significantly, therefore, either Project #1 or #2 should be implemented, but not both.

Project #3: Replace Hot Water Heater: Install a newer or more efficient natural gas hot water heating system. Use one of the heaters that will be shut off in another township building. The high cost will be if a new unit is purchased and installed.

Project #4: Reduce Hot Water Use: Install flow restriction shower nozzles and add automatic faucet controls. Savings of between 10-20% can be realized with a small investment; there are rebates from the natural gas utility for this equipment.

Project #5: Occupancy Sensors- Install occupancy sensors in 11 rooms, all offices, apparatus room, locker room, living quarters, bathrooms, and storage areas. The sensors will sense the movement of people and turn on the lights in the area around the sensor. If the sunlight provides enough background lighting the lights will not turn on. Savings can range between 20-60% depending on the area and use patterns, and savings can range between $300-900 per year. The implementation costs can be from $1,600-2,400 which will depend on the lighting circuits and the amount of units required.

Project #6: Replace Exit Lights with LED Units: There are three exit signs that use incandescent and or fluorescent lights. The bulb uses 20-50 watts per sign, versus 0.5-3 watts for the new LED lights. Retrofit units can be installed, but for just a few dollars more a new unit can be purchased. The DTE rebate plan provides $12.50 per sign.

Project #7: Replace Kitchen and Break Room Appliances: The building has an Energy Star refrigerator, stove, dishwasher, dryer, clothes washer, etc. On average most kitchen equipment can be replaced, which can save between 10-20% in electricity. The savings is not large enough to justify replacement for that reason only. Although, make it a policy to replace all freezers, refrigerators, dishwashers, stoves with Energy Star products.

Project #8: Employee Training: Provide training for all employees working in the building regarding energy use and costs. Many times employees make decisions to use energy, and do it without any idea of how their choices affect the consumption of energy. The lights where left on and no one was in the facility, windows were open and AC was working to maintain temperature. Typical savings can be thousands of dollars on 5% of the consumption. The savings for the #2 Fire Station can range between 90-180 per year.

Project #9: Purchase Natural Gas from another Source: Natural gas can be purchased from brokers which sell natural gas at a discount, and savings can range between 10-30% of the rates being paid today. This can account for an estimated $350-1,050 per year.

Project #10: Purchase Electricity from Another Source than DTE: Electricity can be purchased from brokers which sell electricity at a discount when compared to the utility DTE. There is a limited amount

of KW that are allowed for this service in the entire DTE grid. Thus, at this time there is nothing available to purchase, but is soon to change this fall. Savings can reach between $550-1,100 per year.

Project #11: Track Energy Use on Monthly Basis: Inform employees of use and track other buildings for comparison purposes. More detailed tracking can be accomplished with daily meter reading which is not part of this project. The savings can be $50-100 with a cost of $100-200. The ROI can be 4.0 years.

Project #12: Utility Rebates: Several of the energy projects implemented may warrant a rebate from the utility companies. Incentive rebates on potential projects are 1, 2, 3, 4, 5, 6, and 7. The amount of the rebates will depend on the particular projects implemented. There is a limited amount of money for these projects, thus the rebates are not guaranteed.

BLOOMFIELD TOWNSHIP #3 FIRE STATION TEA REPORT

The #3 Fire Station building is made up of an apparatus room, garage, living quarters, control room, locker room and storage areas. In total this is a 5,894 square foot building. Annual energy costs total $10,020 with $6,756 for electricity and $3,264 for natural gas. The building energy consumption is at 108.0 KBTU/sq. ft. and the cost is $2.02/q. ft. Similar buildings average 77 KBTU/sq. ft.

The Technical Energy Audit (TEA) includes: TEA Report and Recommendations, Appendix A: Potential Project Listing; Appendix B: Lighting Survey, TEA Audit Findings Summary Sheet with Energy Star Portfolio Manager, Natural Gas Consumption and Cost Report, and Electrical Consumption and Cost Report.

POTENTIAL PROJECTS

The #3 Fire Station has 16 Energy Conservation Projects (ECP) which have been revealed in the Technical Energy Audit performed by the Avrie Group. Of these projects twelve are recommended to be implemented, which will save between $2,025-4,630 per year. These savings are equal to 20-46% of the last year's annual energy costs for the building. The cost to implement these projects will range between $3,420-6,060, and the return on investment ranges between 0.7 and 10 years.

Utility rebate incentives can be applied to eight of the recommended projects described later in this report, although we recommend projects 1, 3, 5, 7, 8, 9, 10 and 11. Each incentive dollar amount will depend on the size of the units, efficiency, and other important details of the equipment installed.

The list below shows the recommended projects to be implemented. Details of all the projects can be seen in Appendix A.

Project #	Project Name	Low Side Savings	High Side Savings	High Side Capital Costs	Years ROI
3	Install tamper proof set back thermostats	450	900	900	2.0
5	Reduce hot water use	20	40	200	10.0
7	Replace Parking Lot Lights	120	150	900	7.5
8	Occupancy sensors in 10 rooms	290	870	2,200	7.6
9	Replace exit lights with LED units	55	140	360	6.5
10	Replace Toilets with low water use un its.	Water Savings			n/a
11	Purchased kitchen appliances that are Energy Star products	Will depend on what is replaced			n/a
12	Employee Training	90	180	300	3.3
13	Purchase Natural Gas from another source	320	960	500	1.6
14	Purchase electricity from another source than DTE	670	1,320	500	0.7
15	Track Energy Use on Monthly Basis	50	100	200	4.0
16	Utility rebates	Depending on which projects are implemented		Incentive rebates on potential projects items #1, 3, 5, 7, 8, 9, 10, 11	n/a
	Total Proposed Projects (Either Project #1 or #2 can be implemented, the higher ROI project was cut)	**2,025**	**4,630**	**6,060**	**3.0 years**

Details of Recommended Projects

Project #3: Install Tamper Proof with Password Protected Set Back Thermostats: Thermostats are allowed to be controlled by anyone that pleases to make a change. A prescribed set point will be established and the unit will be run at scheduled times. If the EMS system is installed this will be included in that system. Savings will be $450-900 per year, with a cost of $600-900. If this project is installed, the EMS project savings will be lowered significantly, therefore, either Project #1 or #3 should be implemented, but not both.

Project #5: Replace Hot Water Heater: Install a newer more efficient natural gas hot water heating system. Use one of the heaters that will be shut off in another Township building. The high cost will be if a new unit is purchased and installed.

Project #7: Replace Parking Lot Lights: Replace parking lot 175 watt fixtures with induction fixtures that will use 90 watts each. Savings will be $120-150 per years for a cost of $600-900. The ROI will be 7.5 years.

Project #8: Occupancy Sensors: Install occupancy sensors in 10 rooms, all offices, apparatus room, locker room, living quarters, bathrooms, and storage areas. The sensors will sense the movement of people and turn on the lights in the area around the sensor. If the sunlight provides enough background lighting the lights will not turn on. Savings will range between 20-60% depending on the area and use patterns, and savings will range between $290-870 per year. The implementation costs will be from $1,600-2,200 which will depend on the lighting circuits and the amount of units required.

Project #9: Replace Exit Lights with LED Units: There are three exit signs that use incandescent and or fluorescent lights. The bulb uses 20-50 watts per sign, versus 0.5-3 watts for new LED lights. Retrofit units can be installed, but for just a few dollars more a new unit can be purchased. The DTE rebate plan provides $12.50 per sign.

Project #10: Replace Toilets with Low Water Use Units: The present units use 3.6 gallons per flush, versus 1.6 gpf for new style units will amount to a savings of 55%. Savings will not be a direct energy savings for the Township, but will save water.

Project #11: Replace Kitchen and Break Room Appliances: The building doesn't have Energy Star refrigerator, stove, dishwasher, dryer, clothes washer, etc. On average most kitchen equipment can be replaced, which will save between 10-20% in electricity. The savings is not large enough to justify replacement for that reason only. Although, make it policy to replace all freezers, refrigerators, dishwashers, stoves with Energy Star products.

Project #12: Employee Training: Provide training for all employees working in the building regarding energy use and costs. Many times employees make decisions to use energy, and do it without any idea of how their choices affect the consumption of energy. The lights where left on and no one was in the facility, windows were open and AC was working to maintain the temperature. Typical savings can be thousands of dollars on 5% of the consumption. The savings for the Cable building will range between $50-150 per year.

Project #13: Purchase Natural Gas from another Source: Natural gas can be purchased from brokers which sell natural gas at a discount, and savings can range between 10-30% of the rates being paid today. This will account for an estimated $320-960 per year.

Project #14: Purchase Electricity from another Source than DTE: Electricity can be purchased from brokers which sell electricity at a discount when compared to the utility DTE. There is a limited amount of KW that are allowed for this service in the entire DTE grid. Thus, at this time there is nothing to purchase, but is soon to change this fall. Savings can reach between $670-1,320 per year.

Project #15: Track Energy Use on Monthly Basis: Inform employees of use and track other buildings for comparison purposes. More detailed tracking can be accomplished with daily meter reading which is not part of this project. The savings will be $50-100 with a cost of $100-200. The ROI will be 4.0 years.

Project #16: Utility Rebates: Several of the energy projects implemented may warrant a rebate from the utility companies. Incentive rebates on potential projects are #1, 3, 5, 7, 8, 9, 10 and 11. The amount of the rebates will depend on the particular projects implemented. There is a limited amount of money for these projects, thus the rebates are not guaranteed.

BLOOMFIELD TOWNSHIP #4 FIRE STATION TEA REPORT

The #4 Fire Station building is made up of an apparatus room, garage, living quarters, control room, locker room and storage areas. In total this is a 5,042 square foot building. Annual energy costs total $12,924 with $7,299 for electricity and $5,625 for natural gas. The building energy consumption is at 155.7 KBTU/sq. ft. and the cost is $2.56/sq. ft. Similar buildings average 77 KBTU/sq. ft.

The Technical Energy Audit (TEA) includes: TEA Report & Recommendations, Appendix A: Potential Project Listing, Appendix B: Lighting Survey, TEA Audit Findings Summary Sheet with Energy Star Portfolio Manager, Natural Gas Consumption & Cost Report, and Electrical Consumption & Cost Report.

POTENTIAL PROJECTS

The #4 Fire Station has 18 Energy Conservation Projects (ECP) which have been revealed in the Technical Energy Audit performed by the Avrie Group. Of these projects thirteen are recommended to be implemented, which can save between $2,935-6,450 per year. These savings are equal to 23-50% of the last year's annual energy costs for the building. The cost to implement these projects can range between $6,250-10,160, the return on investment ranges between 0.7 and 10 years.

Utility rebate incentives can be applied to thirteen of the projects (1-13). Each incentive dollar amount will depend on the size of the units, efficiency, and other details of the equipment installed.

The list below shows the recommended projects to be implemented. Details of all the projects can be seen in Appendix A.

Project #	Project Name	Low Side Savings	High Side Savings	High Side Capital Costs	YEARS ROI
5	Install tamper proof set back thermostats	450	900	900	2.0
7	Reduce hot water use	20	40	200	10.0
8	Replace T12 bulbs with T8 fixtures and bulbs	480	700	2,800	5.8
9	Replace Parking Lot Lights	210	270	1,500	7.1
10	Occupancy sensors in 13 rooms	330	1,000	2,900	8.8
11	Replace exit lights with LED units	55	140	360	6.5
12	Replace Toilets with low water use un its.	Water Savings			n/a
13	Purchased kitchen appliances that are Energy Star products	Will depend on what is replaced			n/a
14	Employee Training	60	180	300	5.0
15	Purchase Natural Gas from another source	560	1,680	500	0.9
16	Purchase electricity from another source than DTE	720	1,440	500	0.7
17	Track Energy Use on Monthly Basis	50	100	200	4.0
18	Utility rebates	Depending on which projects are implemented		Incentive rebates onpotential projects #1-14	n/a
	Total Proposed Projects (Either Project #1 or #5 can be implemented, the higher ROI project was cut)	**2,935**	**6,450**	**10,160**	**3.5 years**

Details of Recommended Projects

Project #5: Install Tamper Proof with Password Protected Set Back Thermostats: Thermostats are allowed to be controlled by anyone that pleases to make a change. A prescribed set point will be established and the unit will be run at scheduled times. If the EMS system is installed this will be included in that system. Savings can be $450-900 per year, with a cost of $600-900. If this project is installed, the EMS project savings will be lowered significantly, therefore, either Project #1 or #5 should be implemented, but not both.

Project #7: Replace Hot Water Heater: Install a newer or more efficient natural gas hot water heating system. Use one of the heaters that will be shut off in another township building. The high cost will be if a new unit is purchased and installed.

Project #8: Replace T12 Bulbs with T8 Fixtures, Electronic Ballasts and Bulbs: Replace T12 bulbs with more efficient T8 bulbs and ballasts requiring 11-15.5 watts less per bulb on average.

There are 72 bulbs to be replaced. Savings can be $480-700 per years with an estimated cost to install at $1,950-2,800. The ROI can be 5.8 years.

Project #9: Replace Parking Lot Lights: Replace parking lot 175 watt fixtures with induction fixtures that will use 90 watts each. Savings can be $210-270 per years for a cost of $1,000-1,500. The ROI can be 7.1 years.

Project #10: Occupancy Sensors: Install occupancy sensors in 13 rooms, all offices, apparatus room, locker room, living quarters, bathrooms, and storage areas. The sensors will sense the movement of people and turn on the lights in the area around the sensor. If the sunlight provides enough background lighting the lights will not turn on. Savings can range between 20-60% depending on the area and use patterns, and savings can range between $330-1,000 per year. The implementation costs can be from $2,000-2,900 which will depend on the lighting circuits and the amount of units required.

Project #11: Replace Exit Lights with LED units: There are three exit signs that use incandescent and or fluorescent lights. The bulb uses 20-50 watts per sign, versus 0.5-3 watts for new LED lights. Retrofit units can be installed, but for just a few dollars more a new unit can be purchased. The DTE rebate plan provides $12.50 per sign.

Project #12: Replace Toilets with Low Water Use Units: The present units use 3.6 gallons per flush, versus 1.6 gpf for new style units which can amount to a savings of 55%. Savings will not be a direct energy savings for the Township, but will save water.

Project #13: Replace Kitchen and Break Room Appliances: The building does not have Energy Star refrigerator, stove, dryer, clothes washer, etc., the dishwasher is an Energy Star product. On average most kitchen equipment can be replaced, which can save between 10-20% in electricity. The savings is not large enough to justify replacement for that reason only. Although, make it policy to replace all freezers, refrigerators, dish washers, stoves with Energy Star products.

Project #14: Employee Training: Provide training for all employees working in the building regarding energy use and costs. Many times employees make decisions to use energy, and do it without any idea of how their choices affect the consumption of energy. The lights where left on and no one was in the facility; windows were open and AC was working to maintain the temperature. Typical savings can be thousands of dollars on 5% of the consumption. The savings for the Cable building can range between $60-180 per year.

Project #15: Purchase Natural Gas from another Source: Natural gas can be purchased from brokers which sell natural gas at a discount, and savings can range between 10-30% of the rates being paid today. This can account for an estimated $560-1,680 per year.

Project #16: Purchase Electricity from another Source than DTE: Electricity can be purchased from brokers which sell electricity at a discount when compared to the utility DTE. There is a limited amount of KW that are allowed for this service in the entire DTE grid. Thus, at this time there is nothing to purchase, but that is soon to change this fall. Savings can reach between $720-1,440 per year.

Project #17: Track Energy Use on Monthly Basis: Inform employees of use and track other buildings for comparison purposes. More detailed tracking can be accomplished with daily meter reading, which is not part of this project. The savings can be $50-100 with a cost of $100-200. The ROI will be 4.0 years.

Project #18: Utility Rebates: Several of the energy projects implemented may warrant a rebate from the utility companies. Incentive rebates on potential projects are #1-13. The amount of the rebates will depend on the particular projects implemented. There is a limited amount of money for these projects, thus the rebates are not guaranteed.

BLOOMFIELD TOWNSHIP SENIOR CENTER TEA REPORT

The Senior Center is made up of offices, locker rooms, bathrooms, art rooms, large meeting rooms, exercise rooms, a natatorium, and storage areas. In total there is 24,237 square feet in the building. Annual energy costs total $74,235 with $46,513 for electricity and $27,722 for natural gas. The building energy consumption is 178.5 KBTU/sq. ft. and the cost is $3.06/sq. ft. The average for a similar building in an identical climate is 150-290 KBTU/sq. ft. depending on many variables, such as size and number of pools, exercise room size, etc. When comparing to other buildings it can be seen there is room for improvement in this building.

The Technical Energy Audit (TEA) includes: TEA Report & Recommendations, Appendix A: Potential Project Listing, Appendix B: Lighting Survey, TEA Audit Findings Summary Sheet with Energy Star Portfolio Manager, Natural Gas Consumption & Cost Report, and Electrical Consumption & Cost Report.

POTENTIAL PROJECTS

The Senior Services Center has 20 Energy Conservation Projects (ECP) which have been revealed in the Technical Energy Audit performed by the Avrie Group. All 20 are recommended to be implemented, which can save between $29,720-49,484 per year. These savings are equal to 40-67% of the last year's annual energy costs for the building. The cost to implement these projects can range between $12,000-35,975. The return on investment is 0 to 9.6 years.

Utility rebate incentives can be applied to 6 of the recommended projects (1, 9, 10, 11, 12, 13, 14 & 15). Each incentive dollar amount will depend on the size of the units, efficiency, and other details of the equipment installed.

The list below shows the recommended projects to be implemented. Details of all the projects can be seen in Appendix A.

Proj. #	Project Name	Low side savings	High Side Savings	High Side Costs to Implement	Years ROI
1	Tune Up EMS Systems	800	1,000	800	1.0
2	Install blinds in exercise room to block sunlight	500	950	3,000	6.0
3	Heating thermostat set points lowered	500	1,500	1,000	2.0
4	Air conditioning thermostat set points raised	500	2,000	1,000	2.0
5	Run Pool Water at recommended temperatures	3,000	4,650	100	0.0
6	Pool covers	8,000	9,800	15,000	1.9
7	Run natatorium room temperature identical to water temperature	4,250	6,000	1,000	0.2
8	Increase Natatorium relative humidity	4,400	5,500	1,000	0.2
9	Replace pool water heater	600	900	4,500	7.5
10	Occupancy sensors in bathrooms, conference rooms, art room, etc.	420	1,260	1,200	2.9
11	Occupancy sensors in offices	140	520	1,200	9.6
12	Occupancy sensors in recreation areas	120	360	1,200	10.0
13	Drinking Fountain Timers	120	144	125	1.0
14	Vending Machines	420	700	800	1.9
15	Kitchen appliances Energy Star	Will depend on what is installed			
16	Employee training	250	500	500	2.0
17	Purchase Natural Gas from another source	2,200	6,000	1,000	0.5
18	Purchase electricity from another source than DTE	3,500	7,000	1,000	0.3
19	Track Energy Use on Monthly Basis	100	200	200	2.0
20	Utility Rebates	Will depend on which projects are installed			
	Totals for all projects	**29,720**	**49,484**	**35,975**	**1.2 years**

Details of Recommended Projects

Project #1: Tune up EMS systems - The EMS systems were set up with the specifications from the building designs, which need to be done now customized to the actual building. Many reactions to set point, control methods, air flows, and etc. need to be adjusted to actual conditions. This can allow for savings in some situations and but not all. Estimates of between $700-1,400 per year can be trimmed in electrical and natural gas costs. The costs can be $400-2,000 to implement the adjustments and changes.

Project #2: Install blinds in Exercise Room - Sun increases the cooling load and makes it difficult to keep this room comfortable for people using this room. Savings from this can be $500-950 per year, with a cost to install at $1,500-3,000.

Project #3: Heating Thermostat Set points lowered - Operate temperatures in offices at 68-71 degrees F and garages, basements, etc. at 65-68 degrees F. Several temperatures ranged several degrees above these levels. Savings can be $500-1,500 per year, with a minor cost to implement of $100-1,000.

Project #4: Air Conditioning Thermostat set point raised - Operate air conditioning set points in the offices at 74-76, recreation areas 72-76. Several points ranged lower during the audits. The savings can be $500-2,000 for a cost of $100-1,000.

Project #5: Run pool water at recommended temperatures - Red Cross recommends a 78 degree F water temperature; pools with more seniors use temperatures ranging from 80-82 degrees F. Presently the pool is run at 94 degrees F, if you cut back 2 degrees, savings will be 11%, 4 degrees will save 17%. Savings can reach $3,000-4,650 per year. The implementation costs can be $0-100.

Project #6: Pool Covers - Utilize pool covers on the three pools during non-operating periods. Savings can be as much as 40-75% of the energy to heat the hot water during non-operating periods. Seventy hours per week are non-operating hours, which is 46.5% of the time. Savings can reach 16-31% of the total water heating for the pools. The major portion of the pool should be covered at the end of each day to reduce evaporation and control the humidity/temperature in room. The savings will be $8,000-9,800 per year. The cost to implement has a wide range depending on the quality level of covers/ enclosures purchased.

Project #7: Run Natatorium room temperature identical to water temperature - At present, air temperature is 4-6 degrees F lower than the water temperature. If the temperature is raised 4 degrees F, there could be a savings of 13.3%, or $4,250-6,000.

Project #8: Increase relative humidity in Natatorium - Relative humidity (RH) was 38% (low) compared to other typical natatoriums at 55-70% RH. An increase of 10%-22% can gain large benefits. The savings can be significant at $4,400-5,500, with a cost of $0-1,000 to implement.

Project #9: Replace pool water heater - Present unit is 78% efficient, high efficient units are 90+% efficiency. The costs savings can be $600-900 for a cost of $3,000-4,500.

Project #10: Occupancy Sensors (OS) in Bathrooms, Conference Rooms, Art and Select Rooms - Install occupancy sensors in select rooms, bathrooms, conference rooms and art rooms: 76, T8 and 74 compact fluorescent. Savings of 20-60% is typical. Eight (8) rooms will be adapted with the OS. Savings can range between $420-1,260 per year. The cost to install can be $800-1,200.

Project #11: Occupancy Sensor in Offices and Associated Rooms. Savings of 20-60% is typical. Savings can range between $140-520 per year, savings are higher than the large garage since all the lights are left on versus half, like the large garage. The cost to install can be $900-1,320.

Project #12: Occupancy Sensor in Recreation Areas. Savings of 20-60% is typical. Savings can range between $120-360 per year, savings are higher than the large garage since all the lights are left on versus half, like the large garage. The cost to install can be $800-1,200.

Project #13: Drinking Fountain Timer - Install timers on drinking fountains, so during the times the facility is closed, the units turn off. The cooling done during this time wastes electricity. Four (4) units can utilize these timers.

Project #14: Vending Machine Controls - Minimize energy use of vending machines, install devices which will cut back consumption during scheduled off periods. Reduce lighting in units. Have vendors place high efficiency units. Two vending machines can utilize a control device to obtain these savings. Savings can be $420-700 per year, which can cost $600-800.

Project #15: Replace kitchen and break room appliances - The building does not have Energy Star refrigerator, stove, dish washer, dryer, clothes washer, etc. On average most kitchen equipment can be replaced, which can save between 10-20% in electricity. The savings is not large enough to justify replacement for that reason only. Be prepared, and make it

policy, to replace all freezers, refrigerators, dishwashers, and stoves with Energy Star products.

Project #16: Employee Training - Provide training for all employees working in the building regarding energy use and costs. Typical savings can be thousands of dollars to 5% of the consumption. Savings in the Senior Services Center can be $250-500 per year, for a cost of $100-500.

Project #17: Purchase Natural Gas from another Source. Natural gas can be purchased from brokers, which sell natural gas at a discount when compared to the utility rates. Savings can range between $2,200-6,000 per year. This can cost $250-1,000 to implement.

Project #18: Purchase Electricity from another Source other than DTE. Electricity can be purchased from brokers, which sell electricity at a discount when compared to DTE. There is a limited amount of KW allowed for this service in the entire DTE grid. Thus, at this time there is none available to be purchased, but this is soon to change. Savings can reach between $3,500-7,000 per year.

Project #19: Track Energy Use on Monthly Basis - Inform employees of use and track versus other buildings for comparison purposes. More detailed tracking can be accomplished with daily meter readings, which is not part of this project. Savings can be $100-300 per year at a cost of $100-200.

Project #20: Utility Rebates. Several of the energy projects implemented may warrant a rebate from the utilities. The projects that meet the requirements are #1, 9, 10, 11, 12, 13, 14 & 15. Savings will depend on the specific projects implemented and the type of equipment used.