

RADNOR TOWNSHIP

GREENHOUSE GAS
ACTION PLAN

April 2012

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I. Introduction

In September 2007, Radnor Township declared its intent to endorse the U.S. Mayors' Climate Protection Agreement, which calls upon cities across the United States to join in establishing goals and strategies to reduce their emissions of greenhouse gases ("GHG"). Radnor Township recognized the need to anticipate and address rising energy costs and to continue Radnor's leadership role in environmental protection, building on the benefits already accrued through Radnor Township's purchase of energy from renewable sources and investments in energy efficiency. By way of [Board of Commissioners Resolution 2007-24](#), Radnor Township directed the Radnor [Environmental Advisory Council](#) ("EAC") to prepare an inventory of Radnor's GHG emissions and then to develop a proposed action plan to help reduce Radnor's GHG emissions and rising energy costs. Working with Township staff, the EAC completed the emissions inventory in 2008 and 2009 and prepared a report entitled the [Radnor Township GHG Emissions Inventory Report](#) (the "Emissions Inventory"). The EAC presented the Emissions Inventory to the Radnor Township Board of Commissioner at its January 25, 2010 meeting and gave a [summary presentation](#) of the results. The EAC thereafter began work to develop this plan of action to reduce Radnor Township's GHG emissions (the "Action Plan").

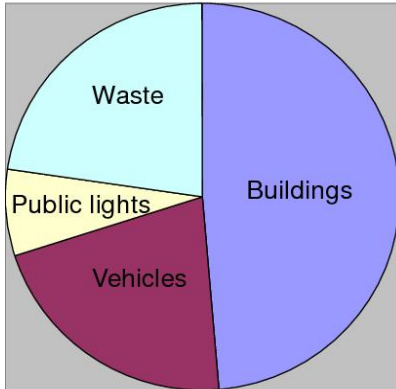
II. Background and Summary of the Radnor Township GHG Emissions Inventory

Most of the energy consumed in the United States is generated from the burning of non-renewable fossil fuels, such as oil and petroleum products (e.g., gasoline, kerosene, propane, diesel, coal and natural gas). As these fuels are burned to produce energy, they release greenhouse gases, such as carbon dioxide, nitrogen oxides, methane, and fluorinated gases, which trap heat within the earth's atmosphere. According to the U.S.- Environmental Protection Agency, scientists are certain that human activities are changing the composition of the earth's atmosphere, and that increasing the concentration of greenhouse gases will change the planet's climate, but they are not sure by how much it will change, at what rate it will change, or what the exact effects will be.¹ Accordingly, federal, state and local governments across the United States, including Radnor Township, are implementing voluntary programs to reduce greenhouse gas emissions, to promote energy-efficiency, renewable energy, and sustainability, and to reduce energy and other costs associated with governmental operations.

The first step that Radnor took in this process was to conduct an inventory of its greenhouse gas emissions. The Emissions Inventory focused on emissions associated with municipal operations, including the Radnor Township School District ("RTSD") and other facilities that received Radnor Township funding and/or services, but excluded most residential and commercial sources. The calendar year 2005 was selected as the baseline year for the Emissions Inventory because a robust data set was available for calculating greenhouse gas emissions for that year and, further, the Delaware Valley Regional Planning Commission ("DVRPC") was preparing a comprehensive greenhouse gas emissions inventory report for the entire Delaware Valley, which also used 2005 as the baseline year. By using the same baseline year as the DVRPC, the Radnor Emissions Inventory could be used in conjunction with the DVRPC report (which included both municipal and community emissions) to assemble a complete picture of greenhouse gas emissions in our community.

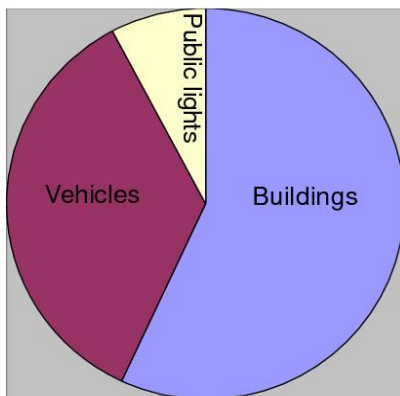
¹ See U.S. EPA website at <http://www.epa.gov/climatechange/basicinfo.html> (September 11, 2011).

The Emissions Inventory showed that the major sources of municipal GHG emissions in Radnor Township are from the following sources: municipal buildings, the vehicle fleet, public lighting, water and sewage pumping and waste disposal. As shown in the following charts, the total emissions from these sources in 2005 were 10,827 tons of carbon dioxide equivalents (CO₂e). The total cost of the energy used by these sources was \$1,762,161.



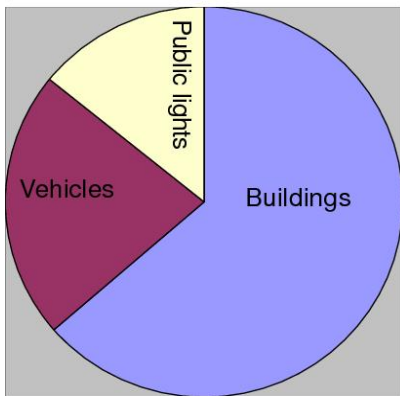
Air Emissions by Source
in Tons of CO₂e

Buildings	5,253	49%
Vehicles	2,324	21%
Public lighting	763	7%
Waste	2,471	23%
Water/sewer	16	0%
Total	10,827	100%



Total Energy Usage by Source
in millions of BTU

Buildings	43,175	57%
Vehicles	26,945	35%
Public lighting	5,848	8%
Waste	NA	NA
Water/sewer	100	0%
Total	76,068	100%



Cost for Energy by Source
In dollars per year

Buildings	\$1,115,150	63%
Vehicles	391,594	22%
Public lighting	248,486	14%
Waste	NA	NA
Water/sewer	6,931	0%
Total	\$1,762,161	100%

III. The Action Plan Development Process

With the completion of the Emissions Inventory, the Township proceeded to develop an action plan for greenhouse gas reductions, energy savings and sustainability initiatives.

Members of the EAC met with several township employees to discuss potential action plan items. The goal of these meetings was to understand the constraints under which township departments operate (budgetary, manpower, etc.), learn of projects underway or in planning in which greenhouse gas emissions could be affected, and to discuss potential action plan items with the department head who understands the most about how a particular action plan item would affect operations in the township.

A list of potential action plan items were compiled from ideas provided by EAC members, from interviews with Township staff and the RTSD Director of Operations, and from action plans completed by neighboring municipalities. These potential items were researched and then discussed at multiple EAC meetings, at which time the public was invited to provide comments and suggestions. The EAC thereafter undertook further research and made further refinements to the draft plan. The draft plan was then provided to the Township staff for final review and comment.

IV. Radnor's Record of Actions that Have Already Reduced GHG Emissions

Since 2005 (the baseline year for the Emissions Inventory) Radnor Township has implemented several measures that have reduced annual greenhouse emissions and annual energy expenditures by the Township. Below is a list of some of these measures:

- Traffic signal LED conversions (most red and yellow lamps were upgraded)
- Purchasing PECO wind power (12% of total electric power in 2008 and 2009)
- Energy efficient Township building construction (lighting controls, HVAC, etc.)
- Household recycling program improvements (single stream, leaf collection, etc.)
- Energy efficiency projects at Radnor Schools (geothermal, solar, green roofs, etc.)

V. Reducing GHG Emissions into the Future

Improving energy efficiency provides economic and environmental benefits to the residents of Radnor Township. Economic benefits result from decreasing future purchases of energy which, in 2005, amounted to more than \$1.7 million. Reduced energy consumption also mitigates the risk to Township budgets of increasing energy prices. Environmental benefits include the lowering of greenhouse gas (GHG) emissions and other air pollutants associated with electricity production and fuel combustion.

This GHG reduction action plan includes 15 items detailed in the following pages that will, upon implementation, help Radnor Township reduce the amount of greenhouse gases emitted as a result of operations. This action plan will be implemented over a 20 year period. Items in the plan include actions that take effect in the short term (one to two years), medium term (three to ten years) or long term (eleven to twenty years).

1. Radnor Municipal Green Team

Proposed Action:	<p>Create a Municipal Green Team composed of Township employees who are interested in and/or who have responsibility for operations or areas that may impact the Township’s energy use, sustainability, or GHG emissions. A senior level Township staff member should be designated to lead the Green Team and a representative from each Department should serve on the Green Team. The Green Team will be tasked with leading the Township’s efforts (i) to implement the Radnor GHG Action Plan, (ii) to generate and implement new programs to increase energy-efficiency and sustainability in the Township operations and activities and (iii) to update the Action Plan as a living document. Responsibilities would include:</p> <ul style="list-style-type: none"> a. Develop energy efficiency and sustainability policies and priorities for the Township; b. Coordinate implementation of policies across departments; c. Develop Township policies to guide purchasing decisions, construction practices, waste management, vehicle use, and other activities with the aim of reducing energy use, vehicle miles traveled, fuel consumption, and waste disposal and increasing sustainable practices; d. Develop a program to educate Township employees about the Action Plan, energy efficiency and sustainability activities and resources; and e. Develop a recognition program for outstanding employee efforts and ideas. <p>The Green Team could also, if desired, work with RTSD to advance a coordinated program of sustainability initiatives and include this in the school curriculum at appropriate levels. The Green Team also could consider developing student projects that help carry out some of the actions in the Action Plan</p>
Implementation Status:	Not yet implemented
Estimated Annual GHG Reduction:	To be determined (TBD)
Estimated Cost to Implement:	None
Estimated Annual Cost Savings:	TBD
Estimated Payback Period:	TBD
Responsible Entity:	Twp Administration
Term:	Short

2. Self-Funding Green Projects Budget/Account

Proposed Action:	Create a self-funding green projects budget/account. Account funds would be “gained” through the energy cost saving measures implemented from the Action Plan. Account funds could be spent on other Action Plan items or new projects that reduce GHG emissions.
Implementation Status:	Not yet implemented
Estimated Annual GHG Reduction:	No direct GHG reductions.
Estimated Cost to Implement:	None
Estimated Annual Cost Savings:	TBD
Estimated Payback Period:	NA
Responsible Entity:	Twp Administration
Term:	Short

3. Streetlight LED Conversion

Proposed Action:	<p>Convert streetlights to energy efficient light emitting diode (LED bulbs. LEDs offer the most efficient and environmentally clean lighting source for streetlighting that is available today. They are solid-state devices, rather than glass tubes with filaments, which make LEDs far more durable and long lasting than traditional bulbs. LEDs long lifespan significantly reduces maintenance costs and reduces the overall impact on landfills and the environment. In 2005 Radnor Township spent approximately \$234,000 on electricity bills for street lighting and lighting in public parks. Moreover, 2005 energy expenditures on street lighting were higher than either the Township buildings or vehicles sector (not including the Radnor School District expenditures). Installing LED streetlights presents a unique opportunity to reduce these energy costs and associated greenhouse gas emissions.</p> <p>Prior to the initiation of any campaign to upgrade lighting, a careful inventory of existing lighting should be conducted to verify the actual quantity and type of fixtures located throughout the township. An updated inventory ensures that our PECO bill(s) are accurate. The inventory also serves as a basis for developing a scope of work, estimated cost and estimated benefit to a streetlight upgrade project.</p> <p>Case studies of LED streetlight replacement projects have found that a 50% reduction in energy expenditures can result from such a project. This equates to \$117,000 of annual energy cost savings using electricity costs from 2005. As electricity becomes more expensive, the annual savings increase correspondingly.</p>
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Implementation Status:	Not yet implemented
Estimated Annual GHG Reduction:	349 MT CO ₂ e/yr (metric tons of carbon dioxide equivalents per year)
Estimated Cost to Implement:	\$1,700,000 (but costs are rapidly decreasing as the market matures). This figure does not take into account labor and material savings for not replacing burned out old lamps.
Estimated Annual Cost Savings:	\$117,000 (calculated using 2005 electric prices)
Estimated Payback Period:	15 years
Responsible Entity:	Radnor Public Works
Term:	Long

4. Traffic Signal LED Conversion

Proposed Action:	<p>Convert traffic signals and lights to energy efficient light emitting diode (LED) bulbs.</p> <p>In a project completed prior to 2005, Radnor Township converted almost half (830 of 1710) of its traffic signals to LED bulbs. LED traffic signals provide energy savings and reduced maintenance costs that can cut costs approximately 90 percent compared to conventional signal lamps. Further, LED signals' exceptional lifespan can also reduce the overall impact on landfills and the environment.</p> <p>In August 2011, Radnor obtained grant funding in the amount of \$22,519 to retrofit an additional 176 incandescent halogen traffic bulbs with energy efficient LED bulbs. Yellow incandescent halogen bulbs are currently housed within various traffic signals including: "bad curve ahead" signals, pedestrian and park crossings, school zones and crossings. Radnor Township also will be retrofitting yellow and green incandescent halogen bulbs that are used in arrow lights located within intersection traffic signals. All work performed on this project will be provided by the Township's electrician. The grant was awarded under the Municipal Energy Efficiency Grant Program funded by the American Recovery and Reinvestment Act of 2009 (ARRA) Energy Efficiency and Conservation Block Grant (EECBG) through approval by the Delaware County Council. The project also takes advantage of rebates offered through the PECO Smart Ideas program. This project will help Radnor reduce energy consumption and fossil fuel emissions through energy efficiency improvements, while promoting job creation and retention.</p>
Implementation Status:	By the end of 2011, the LED Traffic Signal project will be more than 50% complete.
Estimated Annual GHG Reduction:	64 MT CO ₂ e/yr
Estimated Cost to	Not fully known (\$2,200 for the 2011 portion)

Implement:	
Estimated Annual Cost Savings:	\$14,000
Estimated Payback Period:	Not fully known (less than one year for the 2011 portion)
Responsible Entity:	Public works
Term:	Short

5. Improve Household Recycling Rate

Proposed Action:	<p>Improve household recycling rate in the Township in order to reduce amount of waste that enters the municipal waste stream. The following measures are recommended :</p> <ul style="list-style-type: none"> • Increase public recycling containers by adding new containers at key points around the township such as near restaurants, the Anthony Wayne movie theatre, parks and the library (cost is estimated at \$150 each). The cost of this measure based on 20 containers in heavily trafficked public areas throughout the Township would be \$3,000. • Increase proper disposal of lead-acid batteries and CFL light bulbs by establishing small collection boxes at the library and other township buildings. • Increase the number of electronics recycling collections days in the Township. In Fall 2011, the Township held a successful event, which included collection of electronics, including computers and large screen TVs. Items were collected by an electronics recycling company at no charge to the Township. Increasing this event to two collection days each year (one in the Fall and one in the Spring) would encourage residents to set aside these items for recycling rather than sending them into the waste stream. • Expand recycling programs in municipal facilities, including Township Administration building, police department and recreational facilities. The Township staff could demonstrate leadership in recycling and serve as a model for the community. Undertake review of current recycling efforts in Township buildings for inclusion of paper, plastic, glass and aluminum, as well as need for additional indoor recycling containers. (Indoor containers are much less expensive than the outdoor containers discussed above.) • Enhance the recycling educational program by working with the EAC and other organizations to increase awareness of the recycling efforts. For example, the educational program might include a contest for the Radnor elementary schools to create a design to be used in township recycling materials.
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	<ul style="list-style-type: none"> • Create a biannual educational program on how to compost household waste. For example, Penn State University master gardeners have programs to present composting workshops. • Evaluate whether incentive programs, such as RecycleBank, are effective in increasing recycling rates. <p>Work with the Radnor Township School District to ensure a proactive recycling program in the schools, which can build good habits in students and educate the parents as well.</p>
Implementation Status:	Partially implemented since 2005.
Estimated Annual GHG Reduction:	7 metric tons for the recycling containers. In addition, the composting initiative could save approximately 110 metric tons based on estimates that an education program which results in 5% of food waste and 25% of yard waste being diverted from the waste stream into composting.
Estimated Cost to Implement:	\$3,000 for 20 recycling containers. The other initiatives should not require any material funding from the Township.
Estimated Cost Savings:	\$13,500: tipping fee savings, based on 5% diversion of incinerated refuse
Estimated Payback:	Unknown
Responsible Entity:	Twp Administration and EAC for educational component
Term:	Short

6. Improve Yard Waste Recycling

Proposed Action:	<p>Improve yard waste recycling (curbside pickup) rates and promote on-lot yard and vegetable food waste composting. The goal of this measure is to reduce the amount of organic (vegetation) material that enters the municipal waste stream.</p> <p>The Township implemented curbside pickup of yard waste in 2010. To increase participation, the following measures are recommended:</p> <ol style="list-style-type: none"> Educate residents about the yard waste recycling program, Encourage use of mulching mowers, Instruct Township employees not to accept yard waste in the municipal trash pickup, To generate enthusiasm about recycling yard waste and to increase the use of composted material, investigate the feasibility of offering compost delivery directly to residents' properties (for a fee to cover the cost of Township employee labor and vehicle/gas usage). <p>For the Action Plan, it is assumed that yard waste recycling for curbside pickup can be increased by 10 percent. In 2010, the Township collected 3025 tons of yard waste. Based on those figures, a 10 percent increase would equate to an increase of 300 tons. Also, GHG savings attributable to reduced fuel usage is calculated to be 1.4 tons per year savings that can be achieved by hauling the waste to Radnor's Skunk Hollow for composting,</p>
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	<p>as opposed to hauling it to the Covanta facility for incineration. Diverting 300 tons of waste from the municipal waste incineration stream would save an additional 68.6 tons of GHG per year. Total GHG savings for this measure would be 70.0 tons of CO₂e per year.</p> <p>The Township should also promote on-lot composting of yard and vegetable food waste. This practice not only reduces the organic material that enters the waste stream, but also reduces Township gasoline usage required to transport the waste to the landfill or the Township composting site. To increase on-lot composting, the following measures are recommended:</p> <ul style="list-style-type: none"> a) Provide additional online information about composting to Township residents, in addition to information currently posted on the EAC page of Radnor website b) Sponsor workshops for residents on composting.
Implementation Status:	Partially implemented since 2005.
Estimated Annual GHG Reduction:	70.0 MT CO ₂ e/yr
Estimated Cost to Implement:	Minimal (net savings on fuel usage and vehicle wear)
Estimated Annual Cost Savings:	\$7,600 (\$23.45 per ton on Covanta tipping fees, plus hauling savings)
Estimated Payback Period:	N/A
Responsible Entity:	Township Administration, with EAC support
Term:	Medium

7. Green Power Purchasing

Proposed Action:	<p>Purchase electricity generated from renewable resources.</p> <p>The biggest-single step that Radnor Township can take to reduce the carbon emissions from its electricity use is to exercise its opportunity to purchase electricity generated from renewable, carbon-free sources. As was reported to the EAC in 2011 by an electric power provider, the costs of carbon-free electricity are now competitive with those of PECO. To take advantage of the opportunity to purchase electrical power that is both cheaper and carbon-free, Radnor Township should issue a Request for Proposals for electrical power supply to those companies serving this region. Recommended priority criteria for the energy generation should be: cost, Pennsylvania-generated renewable electricity [to help grow the renewable energy market in the state], and a guaranteed rate for a minimum period.</p>
Implementation Status:	Not yet implemented
Estimated Annual GHG Reduction:	1,427 MT CO ₂ e/yr (assuming a 20% renewable component in electricity purchases of Township and the RTSD)

Estimated Cost to Implement:	\$0
Estimated Annual Cost Savings:	TBD (net cost savings are expected)
Estimated Payback Period:	NA
Responsible Entity:	Township Manager
Term:	Short

8. Tree Planting Program

Proposed Action:	<p>Implement a robust tree planting program.</p> <p>Radnor Township should investigate options to implement its own tree planting program or to participate in a national or regional tree planting program. Consider existing programs such as Philadelphia Horticultural Society’s “One Million Trees” initiative (www.plantonemillion.org). Tree planting programs may include those that share planting costs and responsibilities between citizens and the township, as well as Township-only programs. The Township should also evaluate easement and/or tax relief options for landowners willing to plant new large-growth trees. The Township should set a goal of planting 5,000 trees before 2017.</p>
Implementation Status:	75 trees since 2007
Estimated Annual GHG Reduction:	53 MT CO ₂ e/yr
Estimated Cost to Implement:	TBD
Estimated Annual Cost Savings:	None
Estimated Payback Period:	NA
Responsible Entity:	Private/Public Options
Term:	Medium

9. Building Lighting Improvements

Proposed Action:	<p>Undertake building lighting energy efficiency retrofits.</p> <p>Lighting represents a substantial proportion of overall building electrical energy demand. A survey conducted by the U.S. Energy Information Agency in 2003 found that, on average, lighting represented 38% of electricity load for commercial buildings.² While the opportunities to identify cost-effective energy savings from lighting are greater in those Radnor Township-owned buildings that have not been refurbished in recent years, there are likely energy and cost savings opportunities even in relatively recently built or renovated buildings.</p> <p>Replacement of inefficient, incandescent lighting should be the first step. Lighting projects could include incandescent to fluorescent, T12 fluor to T8 or T5 fluor, the installation of LED lamps, daylighting or dimming controls. The payback is short-term and substantial. Alongside the technological advances in lighting products in recent years has been the development of a variety of strategies to optimize lighting through reduction of over-lighting, "smart lighting" with time of day and daylight sensors, and occupancy sensors. Revising building lighting layout, to eliminate unnecessary lighting, offers immediate payback, and reducing excessive lighting offers additional savings.³ Even greater energy savings may be available by optimizing building electrical and mechanical systems, including HVAC and lighting, in an integrated way.</p> <p>An example of relamping and lighting performance improvement measures and their relevant payback periods is provided by a recent Philadelphia office building retrofit. The retrofit, which involved an investment of \$43,000 for an estimated annual savings of \$64,000 with a project total payback period of 8 months is highlighted as a case study by the Delaware Valley Regional Planning Commission:⁴</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black;"><u>Investment</u></th> <th style="text-align: left; border-bottom: 1px solid black;"><u>Payback Period</u></th> </tr> </thead> <tbody> <tr> <td>Lighting Motion Sensors</td> <td>3.2 years</td> </tr> <tr> <td>Revise Lighting Layout</td> <td>immediate</td> </tr> <tr> <td>Energy Efficient Lighting Fixtures</td> <td>2 years</td> </tr> </tbody> </table> <p>Another project that provides a rough approximation of the costs and benefits of lighting retrofitting is the ING building in West Chester. Relamping and lighting performance improvements totaling approximately \$30,000 resulted in operating costs savings of \$100,000 over 4 years, or</p>	<u>Investment</u>	<u>Payback Period</u>	Lighting Motion Sensors	3.2 years	Revise Lighting Layout	immediate	Energy Efficient Lighting Fixtures	2 years
<u>Investment</u>	<u>Payback Period</u>								
Lighting Motion Sensors	3.2 years								
Revise Lighting Layout	immediate								
Energy Efficient Lighting Fixtures	2 years								

² U.S. Energy Information Agency- *Consumption and Efficiency: Lighting in Commercial Buildings*, 2009. www.eia.doe.gov/emeu/cbecs/cbecs2003/lighting/lighting1.html

³ For example, energy services company Johnson Controls sites a rule of thumb for energy savings that a 10% dimming in areas where dimming is acceptable will yield almost a 20% energy savings. Johnson Controls, *Ten Tips to Save on Energy Costs*. <http://www.makeyourbuildingswork.com/efficiency-tips/energy-savings/>

⁴ Delaware Valley Regional Planning Commission,- *Energy Efficiency Case Studies: 9-Story Office Building, Philadelphia, PA*. http://www.dvrpc.org/EnergyClimate/pdf/2011-01-21_9-story_Office_Building.pdf DVRPC provides comprehensive guidance to municipalities on greenhouse reduction strategies.

	<p>approximately 20% savings per month, and a reduction of 648 tons CO₂e/year for the 125,000 sf office building.⁵ The relamping, occupancy sensor installations and lighting layout adjustments may roughly approximate the types of improvements that would be cost-effective for Radnor Township's buildings.</p> <p>Performance contracting: Performance contracting offers one affordable means to invest in building energy savings. Under a performance contract a comprehensive building assessment is conducted by an energy services company, a building systems retrofit is designed, and the costs of the work are paid out of the guaranteed energy savings resulting from the work. Depending on the contractor, an initial outlay may be necessary to cover the costs of the energy assessment.</p> <p>An alternative that may prove more advantageous to Radnor Township is to contract with an energy services company for a diagnostic assessment of all of the township's buildings and the preparation of an upgrade plan beginning with projects that offer immediate or short-term payback in cost savings that can be harnessed for additional capital projects. Rebates are available from PECO to help defray the initial costs of investment.⁶</p> <p>Listings of contractors and additional guidance are provided to area communities by Practical Energy Solutions (West Chester, PA).</p>
Implementation Status:	Partially implemented since 2005.
Estimated Annual GHG Reduction:	67 MT CO ₂ e/yr. [30% efficiency improvement on 38% of building electricity demand]
Estimated Cost to Implement:	\$30,000 - \$40,000 not including RTSD
Estimated Annual Cost Savings:	\$14,500 (assuming \$0.12/kWh) not including RTSD
Estimated Payback Period:	2-3 years
Responsible Entity:	Township Administration
Term:	Short

⁵ Delaware Valley Regional Planning Commission, *Energy Efficiency Case Studies: ING Office Building, West Chester, PA.* http://www.dvrpc.org/EnergyClimate/pdf/2011-01-21_ING_Office_Building.pdf

⁶ A upgrade for Peters Township in southwestern PA conducted by Envinity, Inc. is an example of this approach. See: <http://envinity.com/commercial/energyconsulting/PetersTownship.php>

10. Recommission Township Buildings

Proposed Action:	Recommission Township buildings (other than RTSD buildings, which are managed by RTSD). Recommissioning Township buildings would require reviewing and testing to ensure that lighting and HVAC systems are performing according to the building design’s original intent and the Township's current requirements. The process of commissioning a new building provides confirmation that building systems function according to the criteria in the building specifications. Commissioning existing systems may require developing new functional criteria to address the current requirements for system performance. This process, known as retro-commissioning, systematically investigates, analyzes and optimizes the performance of building systems.
Implementation Status:	Not yet implemented
Estimated Annual GHG Reduction:	150 MT CO ₂ e/yr
Estimated Cost to Implement:	\$30,000 (\$0.27 per square foot)
Estimated Annual Cost Savings:	\$30,000
Estimated Payback Period:	Approximately one year
Responsible Entity:	Township Manager
Term:	Medium

11. Greening of Township Vehicle Fleet

Proposed Action:	Implement a program to green the Township’s vehicle fleet. The Township has approximately 150 gasoline and diesel powered vehicles. The Township can reduce its greenhouse gas emissions by reducing the size of vehicles in its fleet, and/or switching to more efficient technologies such as diesel, hybrid, or electric. The Township should, at a minimum, purchase passenger cars that get at least 30 miles per gallon (mpg) in EPA mixed driving and light trucks that get at least 20 mpg EPA mixed driving. It is estimated that this program would result in at least a 33 percent reduction in gasoline consumption in Township vehicles. A Green Fleet program would provide a mechanism to allow fuel efficiency considerations to receive appropriate weight in purchasing decisions. Staff and officials perform purchasing functions should be made aware of the range of options available through state purchasing contracts, many of which have reduced upfront costs, as well as reduced lifecycle costs.
Implementation Status:	This measure is targeted for long-term implementation as greening the fleet would progress as vehicles are replaced.
Estimated Annual GHG Reduction:	223 MT CO ₂ e/yr (gasoline vehicles, assuming 33% economy improvement) 184 MT CO ₂ e/yr (diesel vehicles, assuming 33% economy improvement)

Estimated Cost to Implement:	TBD
Estimated Annual Cost Savings:	\$67,000 (gasoline savings, at \$3.00/gallon) \$61,000 (diesel savings, at \$3.50/gallon)
Estimated Payback Period:	TBD
Responsible Entity:	Public Works, Police, Administration
Term:	Long

12. Implementation of Energy Efficient IT Practices

Proposed Action:	Create an IT Strategic Plan for lowering energy consumption. Radnor Township IT should conduct an internal evaluation of energy consumption for all existing IT infrastructures (desktop, server and storage environments). The strategic plan should identify all systems employed at the Township, and provide an overview of available computing platforms and technologies which could potentially be leveraged by the Township to reduce or offload energy consumption (i.e. cloud services, virtualized desktops, shared services). The Strategic Plan should provide an assessment or conclusion which identifies each system’s potential, and associated cost, to become more energy efficient. If Radnor Township has previously evaluated use of cloud services and alternative computing, but decided against using these options, it should document the results of the evaluation in a public report.
Implementation Status:	Not yet implemented.
Estimated Annual GHG Reduction:	TBD. Offloading computing (server and storage) resources to a cloud model reduces the townships GHG footprint by eliminating the powering, cooling and physical location costs associated with those servers and storage.
Estimated Cost to Implement:	Minimal. Creating the IT Strategic Plan for lowering energy consumption should be an internal effort by Township IT staff.
Estimated Annual Cost Savings:	TBD. Township IT staff should incorporate cost calculations in the report. Cost calculators are available from some service providers such as Amazon Web Services, see “Resources & Tools” at this link: http://aws.amazon.com/economics/
Estimated Payback Period:	TBD. The initial effort of creating the IT Strategic Plan does not have an associated cost or payback period. However, the implementation of energy efficient IT practices should reduce Township energy expenditures.
Responsible Entity:	Township IT staff and Township Manager
Term:	Short

13. Green Procurement Policy

Proposed Action:	<p>Develop and implement “green” purchasing/procurement policy to ensure consideration of environmental and sustainability factors in Township purchasing decisions and to encourage the purchase of energy-efficient and sustainable products and services wherever practicable. This policy should encourage selection of products that conserve energy and water, minimize generation of waste and pollutants, are made from recycled materials (e.g., recycled paper), can be reused or recycled, have less packaging or incorporate other environmentally preferable attributes. EnergyStar and WaterSense labels should be used as a guide for identifying preferred products. Radnor Township is a WaterSense partner with U.S. EPA.</p> <p>This policy should also encourage implementation of “paperless” office practices where feasible, meaning a preference for the use of electronic, rather than paper, communications and file storage where practicable. Use of such practices should help to reduce the quantity of paper and paper-related storage products that the township needs to purchase or procure. Implementation of a green purchasing/procurement policy should, among other things, lead directly to increased purchases of energy-efficient and water-efficient equipment, which will reduce energy and water costs and result in reduced GHG emissions.</p> <p><u>Resources for Reference:</u></p> <p>EPA - http://www.epa.gov/epp/pubs/greenguides.htm</p> <p>EnergyStar - http://www.energystar.gov</p> <p>WaterSense - http://www.epa.gov/WaterSense</p> <p>Responsible Purchasing Network: http://www.responsiblepurchasing.org</p>
Implementation Status:	Not yet implemented
Estimated Annual GHG Reduction:	TBD
Estimated Cost to Implement:	Marginal
Estimated Annual Cost Savings:	TBD
Estimated Payback Period:	TBD
Responsible Entity:	Township Administration, Green Team
Term:	Short

14. Sustainable Parks Policy

<p>Proposed Action:</p>	<p>Develop and implement a sustainable parks policy (“SPP”). The SPP should promote the use of sustainable landscapes wherever practicable in the Township’s parks, trails, gardens and open spaces. In general, sustainable landscapes are those which enable the natural and built systems to work together beneficially to meet the needs of the present without compromising the ability of future generations to meet their own needs. More particularly, the goal of the SPP would be to promote the management of landscapes so as to improve and regenerate the natural benefits and services provided by healthy ecosystems, thus increasing the positive aspects and decreasing the negative aspects associated with maintenance of our public spaces. Sustainable landscapes can be functional, cost-efficient, environmentally-beneficial, and aesthetically pleasing. The SPP should be developed in consultation with landscape professionals familiar with sustainable site design and maintenance principles and with interested members of the community. The following should be considered in the development of the SPP:</p> <ul style="list-style-type: none"> • Use of low-maintenance, native plantings and landscaping techniques to create an attractive environment in balance with the native surroundings, which addresses the desired functions of the public space and minimizes reliance on fertilizers, herbicides, and pesticides. • Use of water conservation strategies to minimize the quantity of water required for park maintenance (e.g., use of native and drought-tolerant plants, rain barrels, drip irrigation). • Use of “rainscaping” strategies, where appropriate, to incorporate design features that retain rainwater through natural controls, increase infiltration, and reduce surface runoff. • Use of reused, reclaimed and recycled materials, including creation/use of compost or mulches from park maintenance and yard wastes, and reuse of other materials in parks. • Increase planting of native trees and shrubs for their shading/cooling benefits and greenhouse gas reduction. • Reduce frequency of lawn mowing and reduce size of underutilized or unnecessary lawn areas. This could save costs by reducing the amount of gas required to mow the approximately 400 acres of public lawn area in the Township and would lower greenhouse gas emissions. <p>The Township should also promote sustainable landscaping practices to Radnor residents and provide educational resources to support implementation of those practices.</p>
<p>Implementation Status:</p>	<p>Partially implemented since 2007.</p>
<p>Estimated Annual GHG</p>	<p>2.3 MT CO₂e/yr</p>

Reduction:	The Township currently mows approximately 400 acres of public lawn area. For this calculation, it is assumed that mowing might be reduced by 10 percent, or 40 acres. Assuming a half gallon of gasoline is required to mow one acre and grass areas are mowed once every two weeks from April through September, annual gasoline savings would be approximately 250 gallons. At 0.009 metric tons CO2 per gallon of gasoline, annual GHG reduction would be approximately 2.3 tons.
Estimated Cost to Implement:	None
Estimated Annual Cost Savings:	\$750 (at \$3 per gallon) plus the benefit of reduced equipment wear.
Estimated Payback Period:	N/A
Responsible Entity:	Township Parks and Recreation Department
Term:	Short

15. Willows Mansion Cottage Energy Efficiency Upgrade

Proposed Action:	Willows Cottage Energy Efficiency and Restoration/ Sustainability Project. This project included the drilling of geothermal wells, installation of new ductwork and a geothermal heating and cooling system, replacement of non-historical windows and doors, and installation of foam insulation. These projects will decrease future energy use, operational costs and associated GHG emissions. This work was funded in part by a “Pennsylvania Conservation Works!” grant of \$244,044.
Implementation Status:	Completed
Estimated Annual GHG Reduction:	<TBD>
Estimated Cost to Implement:	<TBD>
Estimated Annual Cost Savings:	N/A
Estimated Payback Period:	N/A
Responsible Entity:	Friends of the Willows Cottage and Township Administration
Term:	Short