West Norriton Township Ready for 100 Initiative

Fall 2020 RISE Project

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Executive Summary

This paper outlines the work that our group achieved through the Resilient Innovation Sustainable Engineering (RISE) forum in partnership with West Norriton Township (WN). The scope was to establish a baseline of the township's energy usage to assist in their transition to 100% renewable energy by 2050, aligned with the Sierra Club Ready for 100 (RF 100) initiative.

Our group migrated WN's electrical and gas account data through the PECO Smart Energy Use Data Tool (PSEUDT) that was imported into an Energy Star Portfolio Manager account. This gives the ability to benchmark and track monthly energy and gas usage in different buildings to identify areas of success and improvement. In the first weeks of the project, WN's energy contract also expired. Our working group assisted WN by analyzing different electricity procurement options such as grid mix, solar and wind power purchase agreements, and wind renewable energy credits (RECs). The township's change to a RECs contract derived an environmental shift in GHG reduction. Our GHG analysis included the township's past year vehicle usage, natural gas, and electricity, and the shift to RECs caused gasoline powered vehicles to dominate the updated GHG analysis. Research was also performed to identify potential building rebates WN was eligible for. Lastly, to help promote the effort of the township's RF100 pledge, energy savings tips were shared to be distributed to its residents.

The next step of this project will be to continue the analysis of the established baseline. A greater number of energy sources, such as by including lawn care equipment, will be included in an updated GHG analysis. Also, an additional emphasis needs to be put on vehicle transformation to environmentally friendly options. Additionally, rooftop solar analyses can be performed on several township buildings to identify generation potential. Lastly, building audits need to be performed to showcase the potential to replace old equipment with relevant rebates.

Contents

Introduction

Ready for 100 (RF 100) is an initiative from the Sierra Club, an influential grassroots environmental organization in the United States. RF 100 is a pledge that is made by townships and cities that are committed to transition to 100% clean energy. Over 160 cities and towns have currently committed to the initiative, with another 50 currently 100% clean energy powered [1]. Pennsylvania has been at the forefront of RF100 with 30 committed townships.

West Norriton Township RF 100 Pledge

West Norriton (WN) Township committed to RF 100 through their Resolution #20- 1654 on April 14th, 2020 which can be seen in Appendix A. Within the pledge, West Norriton resolved that their township vehicle fleet will be 100% renewable energy sourced by 2030, 100% powered by clean renewable energy by 2035, and use 100% clean renewable energy when replacing heating system and transportation equipment by 2050. Before creating this resolution, West Norriton had already implemented a series of energy efficiency improvements such as sewage pump upgrades, light emitting diode (LED) lighting replacements at facilities, and streetlight LED upgrades.

Goal and Scope

Through the Villanova Resilient Innovation Sustainable Engineering (RISE) forum, our team worked to create an electricity and greenhouse gas baseline. This baseline works to identify possible projects and opportunities for the Township to implement. Additionally, this project worked to review and assess renewable energy alternatives and technologies, procurement strategies including rebates, and provide other recommendations for township consideration. In addition, our team worked with Environmental Advisory Board for WN to

assist in their community day efforts; providing helpful tips for the residents to reduce their electricity consumption and bills.

While this white paper contains the work from Phase I, creating a baseline, it is expected that this information will be transitioned to the implementation of Phase II, where more concrete recommendations will be provided to assist the Township in it's Ready for 100 pledge.

Electricity

Baseline

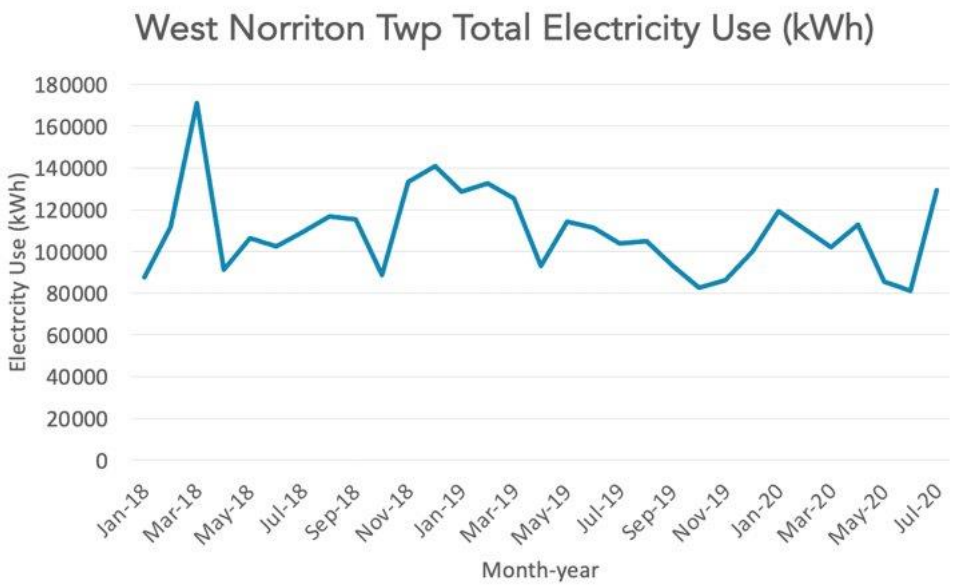

Figure 1: West Norriton Township total electricity use for all properties, excluding streetlights and traffic lights.

Energy Star Portfolio Manager

PECO Smart Energy Use Data Tool (PSEUDT) was developed to aggregate building electric and gas usage. The web-based application helps make retrieval of building energy data fast, simple, and retrievable. The energy use data for each facility is continuously uploaded to

PSEUDT when it becomes available by PECO. The tool is linked here: https://pecoenergyusagedata.com/

A PSEUDT account was created for West Norriton Township and all electricity and gas accounts were added. In order to enroll additional accounts to PSEUDT, this form must be filled out:https://secure.peco.com/WaystoSave/ForYourBusiness/Pages/PECOSmartEnergyUsageDataTool.aspx.

PSEUDT groups energy accounts together by address. West Norriton Township has 16 addresses registered with PECO, and so it has 16 properties in PSEUDT, which may consist of multiple buildings or no buildings. Due to PECO's system, the streetlight and traffic light accounts were not able to be added.

Steps for PSEUDT Use:

1. Log into the account.
2. The first page is the "Dashboard".
3. To find the energy use for each account, click on "Request Summary"
4. Navigate to the address of choice and click "View Usage Data". This is where the tabular energy usage data is, and it can be exported to Excel.

Energy Star Portfolio Manager is the U.S. Environmental Protection Agency's (EPA) application used to enter a building's energy usage in order to benchmark them. With Portfolio Manager, complete details about buildings can be entered and analyzed, including energy use, in order to receive your benchmarking score. Additional information on the township buildings, such as the year built, square footage, and usage, will make the scoring complete and accurate. Portfolio manager also provides an assessment of the total greenhouse gas emissions intensity (kgCO2e/ft2). In Portfolio Manager, monthly energy usage data for the building is made

available through PSEUDT. Energy Star Portfolio Manager is linked here: https://portfoliomanager.energystar.gov/pm/login.html

The data for West Norriton Township is connected from PSEUDT to Energy Star Portfolio Manager and will upload automatically. Since it is coming from PSEUDT, the energy accounts in Portfolio Manager are also grouped together by address. To be clear, Portfolio Manager is a different account, on a different website. After the account is in enrolled in PSEUDT, create a new property in Portfolio, and then the building can be connected through the sharing tab.

Buildings with correct information (square footage, year built, etc.) with an Energy Star score of over 75 are eligible for an Energy Star Certification. Third party verification is needed.

Steps for Energy Star Portfolio Manager Use:

1. Log in to portfolio manager.
2. The dashboard shows all 16 properties.
3. Click on the property name, and that will take you to the property profile.
4. On the property profile, the summary tab shows metrics, such as Total GHG Emissions Intensity, Source Energy, and Site energy.
5. The energy tab shows a graph of the monthly energy usage for that property.

The complete guide to using PSDEUT and Energy Star Portfolio Manager is linked here: https://www.peco.com/SiteCollectionDocuments/PSEUDT_Energy_Star_Guide_v2.5.pdf . West Norriton's 1630 W Marshall property's electricity and gas usage can be seen below in Figure 2. Each property on Portfolio Manager has this graphical usage representation that can be downloaded as an excel spreadsheet or image.

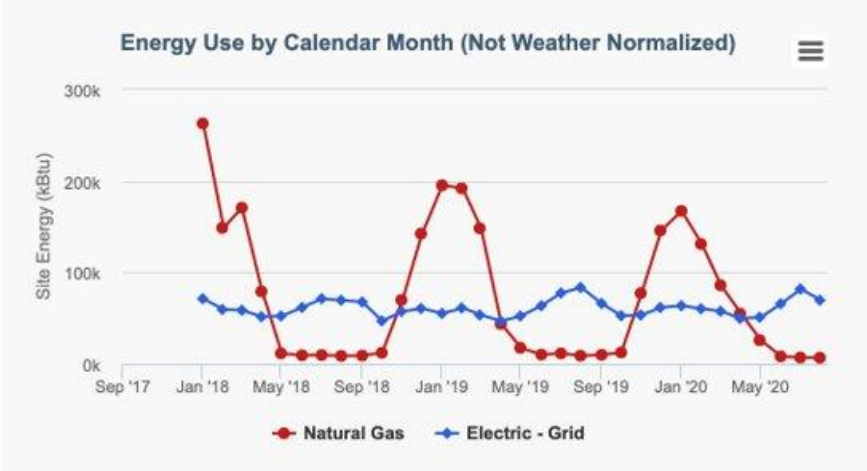

Figure 2:1630 W Marshall property electric and gas data in Energy Star Portfolio Manager.

In summary the transition of physical PECO bills to Portfolio Manager can be seen below in Figure 3. Portfolio Manager can utilize PSEUDT's data to organize electric and gas bills for easy energy and environmental analysis.

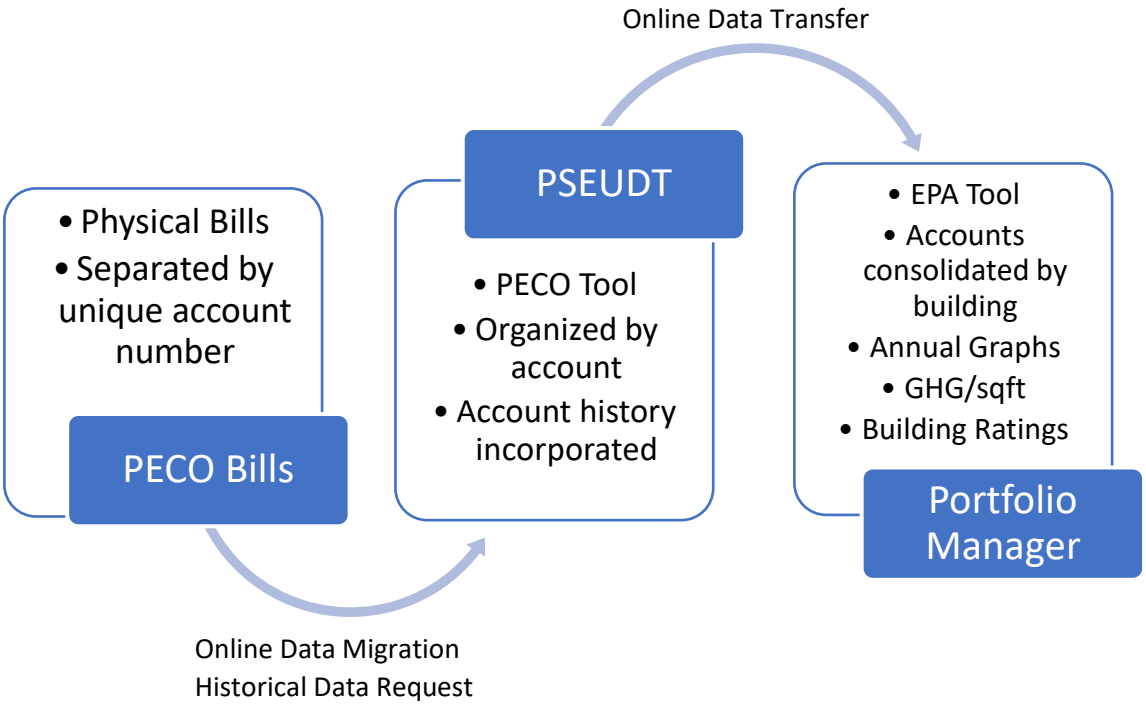

Figure 3: PECO and Energy Star Data Tool Progression.

Energy Sourcing

Renewable Procurement Options

The energy sourcing phase of this project was performed to validate the township's energy sourcing choice for the upcoming five years. With the offers the township received, a large-scale solar power purchase agreement (PPA) and wind PPA were chosen to compare with a baseline of the grid mix electricity tariff, 0.07$/ kilowatt-hour (kWh) and 3% annual price escalation rate, as well as their environmental impact.

The economic and environmental comparison is based on life-cycle analyses, which transcends the generation phase, to evaluate the impact of the energy systems from a cradle-to-grave perspective. This will avoid any misleading analyses solely based on generation and transmission after utility installation.

Aggregated Solar PPA

Through investigating renewable energy procurement options, an aggregated solar power purchase agreement (PPA) opportunity was found through an inter-state program for municipalities. The kWh price is estimated to be $0.06 with a 2% price escalation rate for 20 years. Based on the average annual demand for the township, large-scale solar PPAs would cover 100% of the township's energy demand with a 20% cost reduction. This is compared to the current energy price from a fossil fuel-based grid mix, the baseline. Moreover, the largescale power purchase agreement (PPA) cuts 77% of the township's emissions if compared to that same grid mix baseline.

Wind Power Purchase Agreement

Wind PPAs are usually the mainstream contractual method for utilizing wind turbine generation. With the restrictive geographical requirements for wind turbines, West Norriton decided to purchase wind Renewable Energy Credits (RECs) to cover 100% of their electricity

demand. Therefore, two economic analyses were performed for both a wind PPA and wind RECs purchase.

For the wind PPA, the following assumption were made:

- The base price of a kWh generated from a wind turbine is $0.04 the first year
- The base annual price escalation rate is 2%
- The township would source 100% of their energy through wind energy.

Similar to the large scale solar PPA assumption and projected pricing for 20 years, a 47% cost reduction is expected if compared to the baseline. In addition, a 97% reduction in GHG is expected upon sourcing 100% of the township energy through wind.

Wind RECs

For wind Recs, the economic analysis was based on the following parameters to include the tariff the township received from Hudson:

- The base price of a kWh generated from a wind turbine is $0.050 for the first 5 years
- The base price escalation rate is 2% every five years
- The township would source 100% of their energy through wind energy.

Projected savings expected for 20 years is 43% if compared to the baseline. Similar to a wind PPA, a 97% reduction in GHG is expected upon sourcing 100% of the township energy through wind RECs. Table 1 summarizes the economic analysis for energy sourcing options investigated. Appendix-B includes the detailed annual calculation

Table 1: Energy Sourcing Economic Analysis

	Grid (Current)	Aggregated Solar PPA ($0.06 /kwh)	Wind PPA ($0.04 /kwh)	PA Hudson (100% Clean Energy - 5 year Contract)	PA Hudson (100% Grid Mix)	PA Hudson (100% Clean Energy - 1 year Contract)
Total cost over 20 years	$1,578,365	$1,263,032	$842,021	$901,637	$915,204	$1,048,316

Expected average annual utility bill over 20 years	$78,918	$63,151	$42,101	$45,081	$45,760	$52,415
Expected average KWh Price over 20 years	0.09109	0.07289	0.04859	0.05204	0.05282	0.06050
Savings % with respect to grid price over 20 years	**0%**	**20%**	**47%**	**43%**	**42%**	**34%**

Analysis Results

Upon analyzing different electricity tariffs, the wind PPA was found to be the most economic option, followed by the wind RECs. The difference between the first two options is marginal, around 3%. In order to visualize the pricing trend of electricity bill over the next 20 years, Figure 4 has been developed to benchmark expected annual bills over 20 years. Red represents a grid mix, blue is an aggregated solar PPA, gray is a wind PPA, and the dashed green is wind RECs.

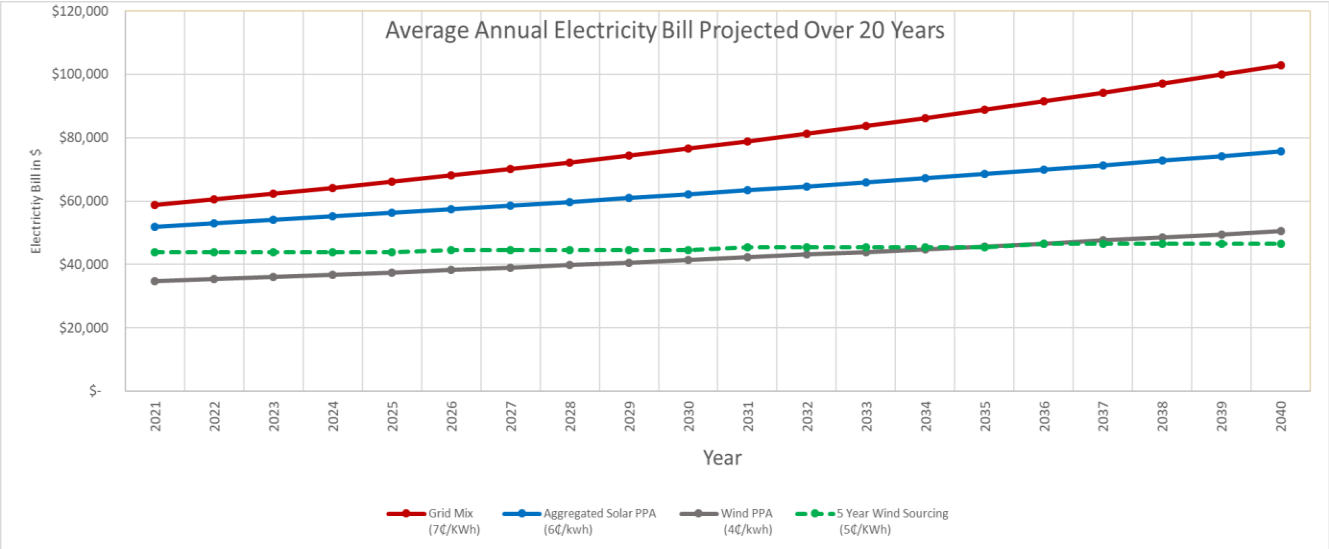

Figure 4: Energy Sourcing Options Annual Projected Electricity Bill

Figure 5 shows an economic-environmental matrix developed to visualize the environmental impact and cost associated with each energy option in order to optimize the selection and ranking process for the various energy options. As shown in the figure, the township made the best choice for the environmental impact, and second to best choice when it comes to economics.

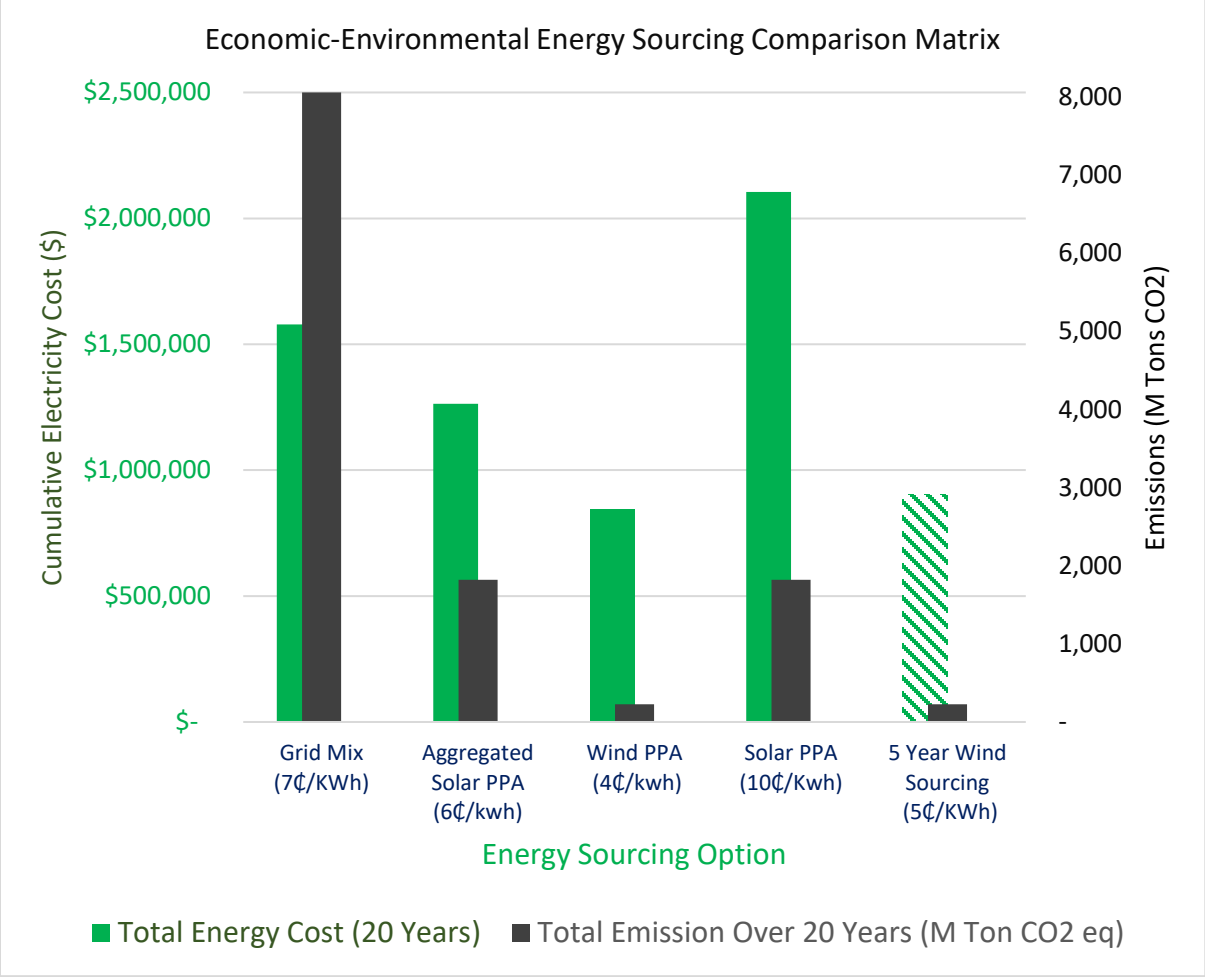

Figure 5: Economic-Environmental Impact of Energy Sourcing Options

Energy Breakdown

With the results from the Energy Star Portfolio Manager, the accounts were able to be compiled by facility to visualize the electricity breakdown in the township. As seen in Figure 6,

these facilities and accounts were grouped into four categories: Pump Stations, Streetlights, the Jefferson Golf Club, and Other Buildings. Each facility/account is broken by a different color shade in the inner circle. Buildings are the top consumer of electricity in the township, with the largest facility being the Jefferson Golf Club that contains multiple PECO accounts. Pump Stations, including sewage ejector stations, almost took a third of the electricity consumption as well. Street and traffic lighting took less energy at fifteen percent, most likely due to the Township transitioning to LED bulbs in 2014 [2].

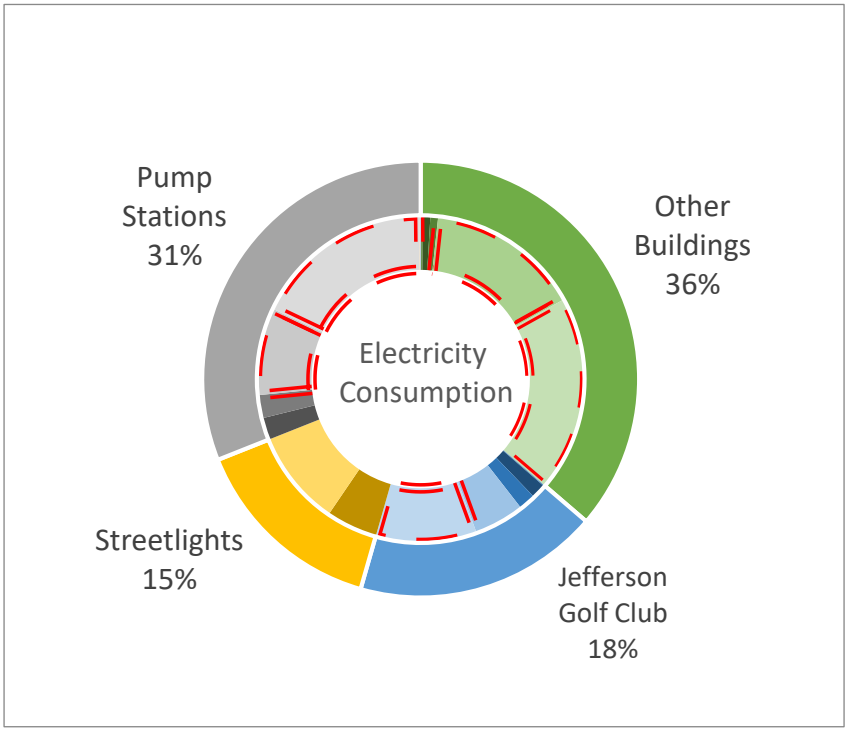

Figure 6: Electricity Consumption Breakdown by Accounts and Types

A quick analysis was performed on West Norriton's five largest electricity consumers, excluding the street lighting account. These accounts are highlighted in Figure 6 and 7 by dashed lines/rings. The largest consumer was the West Norriton facility at Whitehall road, consuming almost 20% (279,360 kWh) of West Norriton's electricity consumption. Two of the five largest consumers were the pump stations at Port Indian and Rittenhouse. West Norriton may wish to

determine whether more energy efficient pumps are available or whether additional operational modifications can yield additional energy savings. The township has confirmed that upgrades have been implemented at the Rittenhouse facility with additional upgrades planned for the future.

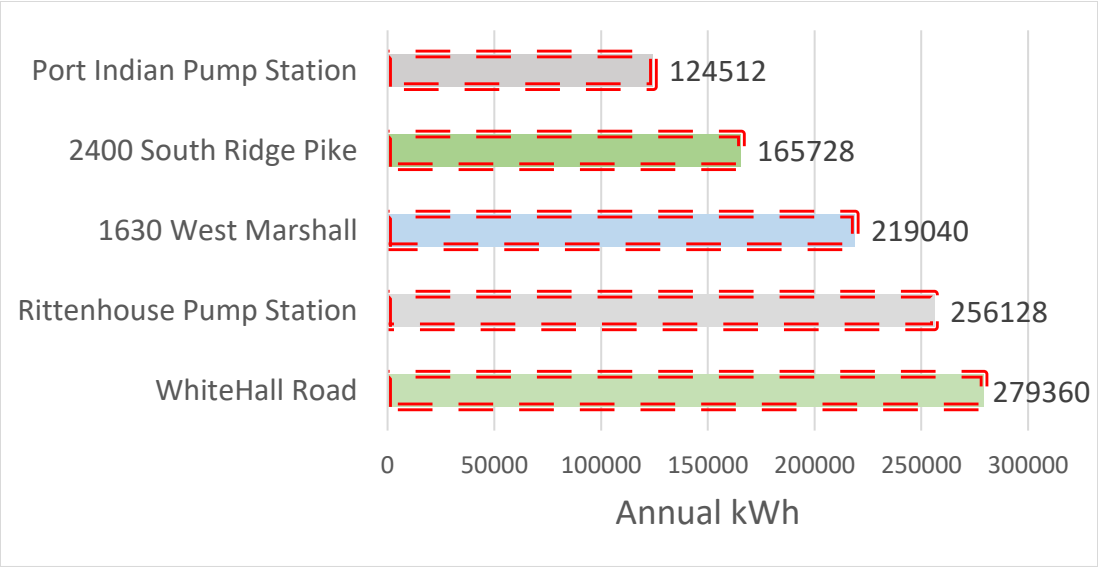

Figure 7: Top Electricity Consuming Accounts

Fuels

For our initial baseline calculations, we focused on three different types of fuel use within the township: natural gas in buildings, vehicles, and lawn care equipment.

Natural Gas

Natural gas use was found in two of the buildings, one at 1630 West Marshall St and another at 2400 W. Main St, the Jefferson Golf Course. These buildings used a total of 7,164 and 5,901 CCFs (100 Cubic Feet) respectively of natural gas use.

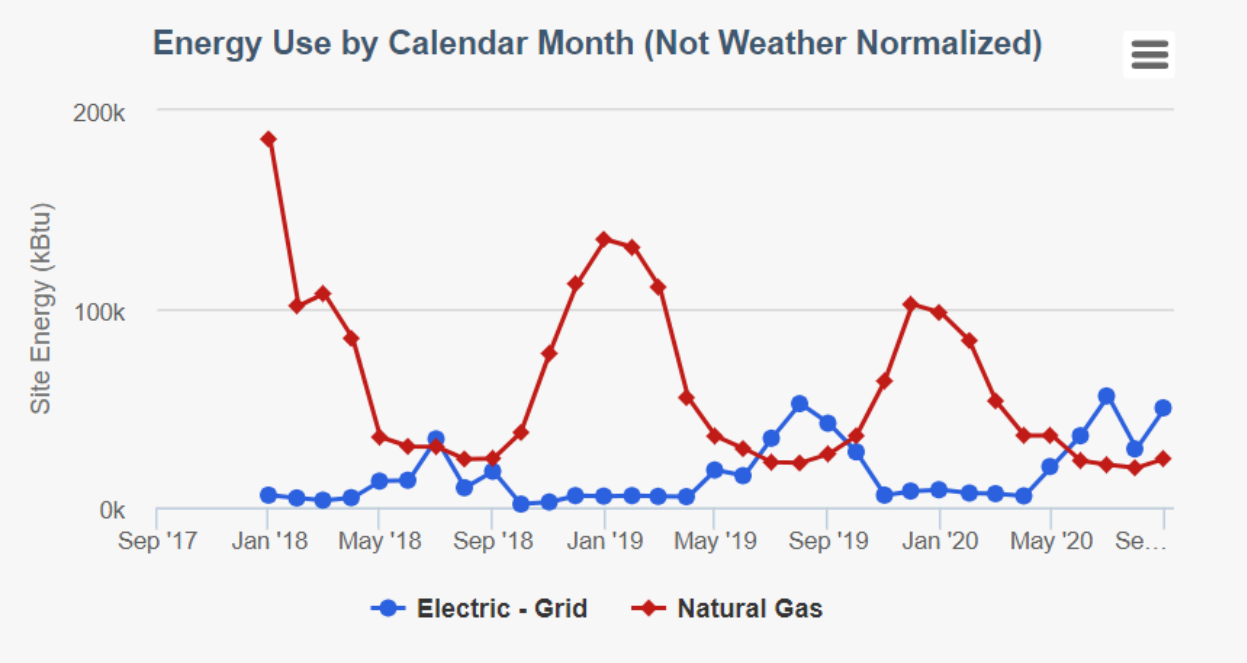

Figure 8: Electricity and Natural Gas Consumption of the Jefferson Golf Club

As seen above, the Jefferson Golf Club has a varying gas and electrical use depending on the season. With the high spikes of natural gas in the winter and electricity in the summer, this depicts the high use of natural gas-powered hot water heating and forced hot air within the winter, and electrical cooling with window units. This exemplifies the possibility of looking at HVAC upgrades with many of these buildings that have systems that are 15-20 years old.

Vehicles

West Norriton Township maintains vehicle-specific information, such as miles driven and fuel purchases, from which a quick comparison of fuel costs versus miles traveled was performed (Figure 9 below). Many of these vehicles are newer models and are all gasoline or diesel powered; the township does not own any electric vehicles or plug in hybrids. This data will be used as a baseline for future vehicle analyses.

Within the Township, the Police Department has the highest utilization of vehicles, owning 17 with a total mileage of 275, 622 miles. Public Works comes in second at 12 vehicles,

with a total mileage of 58, 365. Lastly, the Administrative Department and Recreation Department own two and one vehicles respectively, with a combined mileage of 41, 261. We can notice the Police Departments heavy usage of vehicles, signaling a potential in finding suitable replacements that are either EVs or more fuel efficient. This has also been a topic of interest for the Township.

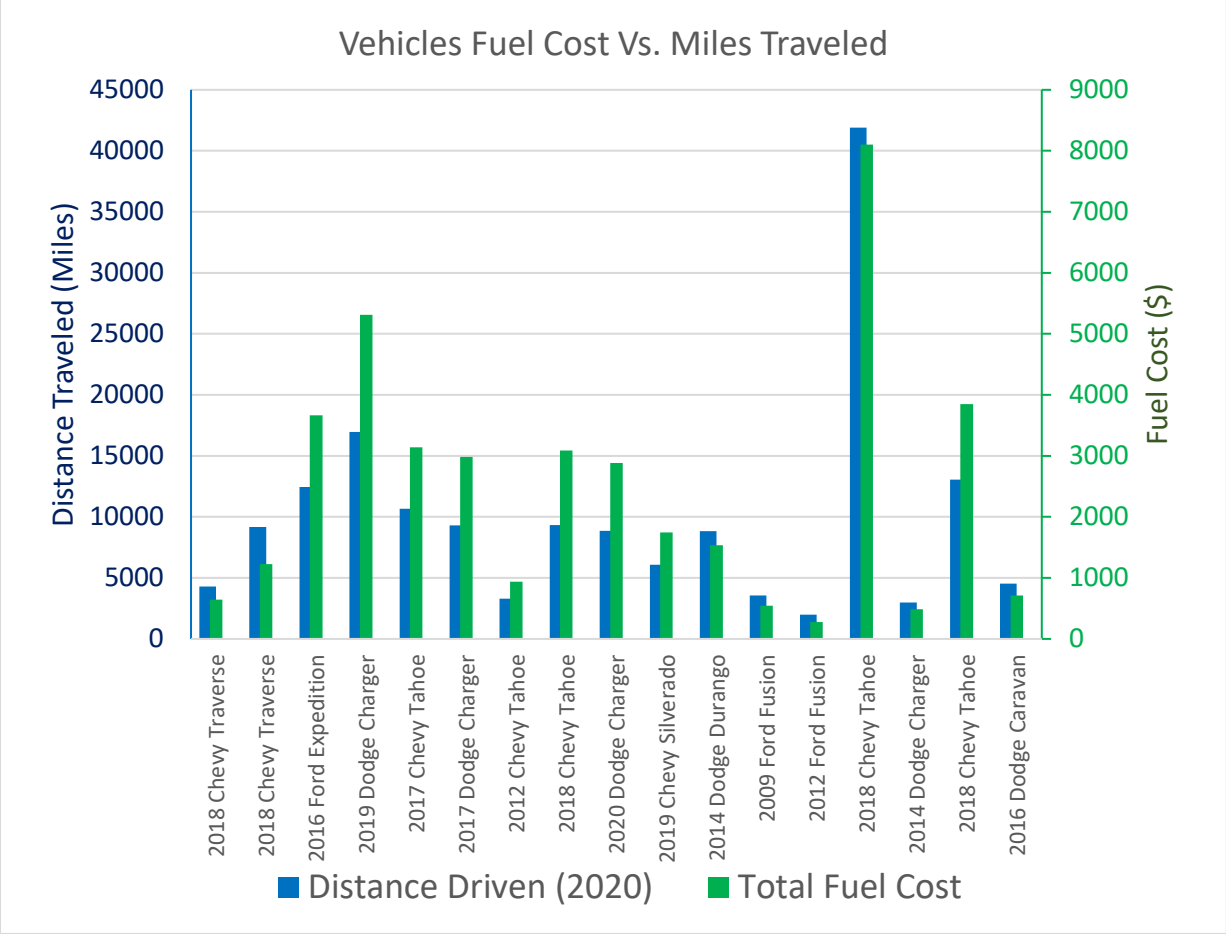

Figure 9: Analysis of Vehicle Miles Driven vs Fuel Costs

Note that golf and utility carts are not included in the vehicle analysis but are shown in the next section.

Lawn Care and Other Equipment

The township also has a large inventory of lawn care equipment and some miscellaneous equipment that are used by the Golf Course or the Public Works Department. These can be seen in Table 2 and Table 3.

Table 2: Lawn Care Equipment Inventory at the Golf Course

Lawn Care Equipment	**Quantity**
Backhoe	1
Tractors	4
Chipper	1
Mowers (Diesel)	5
Mowers (Hybrid)	6
Utility Cart (Gas)	1
Utility Cart (Electric)	1
Golf Carts (Gas)	73
Field Sprayer (Gas)	2
Lawn Aerify's (Gas)	2
Large Utility Cars (Gas)	2
Back Pack Blowers (Gas	2
Weedwhackers (Gas)	6
Pull Behind Blowers (Gas)	2
Chain Saws (Gas)	3

Table 3: Lawn Care Equipment Inventory from Public Works

Lawn Care Equipment	**Quantity**
Weedwhackers (Gas)	4
Leaf Blowers (Gas)	3
Lawn Edger (Gas)	1
Push Leaf Blower (Gas)	1
Chain Saw (Gas)	6
Blacktop Tamper (Gas)	1
Lawn Mower (Diesel)	1
Lawn Mower (Gas)	1

The contribution of gasoline powered lawn care equipment to GHGs can be quite substantial due to the possibility of the 2 or 4 stroke engines not having installed catalytic converters. These engines contribute extensive CO_2 particulate matter which leads to many environmental and human health detriments. It is important to note that the township only has

one electric component in this category: a utility cart. This puts an emphasis on evaluating these different equipment types to upgrading to more fuel efficient or electric alternatives.

Currently, there are only records known for the golf course consumption of diesel: roughly 2000 gallons per year. Gas is shared from onsite tank at the golf club for other purposes. Data has not been compiled yet for other types of lawn care equipment, especially from the Public Works Department, which is something to be continued in later evaluations.

Greenhouse Gases

A greenhouse gas (GHG) analysis was also performed on several sectors of the Township. These sectors were determined by their assumed GHG production: Electricity, Vehicles, and Natural Gas. However, the following analysis is not to be considered as a complete scope 1,2, and 3 carbon management report but as a partial analysis of major energy contributors through scope 1 and 2. More details about general Scope 1, 2, and 3 emissions can be found in Appendix C. Due to the recent addition of the lawn care equipment data, these entities were not able to be evaluated in time for this report.

Electricity

Through the baseline created by Energy Star and the energy sourcing methods discussed earlier in this paper, the GHG analysis looked to discover the emission savings from transitioning from the grid mix to wind RECs. Purchased electricity falls under Scope 2 emissions.

Previous Grid Mix

Table 4 below shows the calculations that determined the GHG emissions in CO2eq from West Norriton's previous energy account. This account used a grid mix from PECO and Hudson, relaying in two separate EPA eGRIDv2 [3] mixes; RCFE and SRMV. The electricity

consumption data from the Energy Star Power Profiler was used in combination with the EPA emission factors [4] to determine the carbon dioxide equivalent. The following global warming potential (GWP) factors were used for Methane and Nitrous Oxide: 25 and 298. These figures were sourced from the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report. The calculation produced shows that their previous energy contract created 553.84 annual tones of CO2e.

Table 4: Annual GHG Calculations from the Previous Electricity Grid Mix

Purchased Electricity (eGRID) - Scope 2	Energy Type	eGRID Region	Total Purchased Energy (kWh)	CO2 Emission Factor (lb CO2/ MWh)	CH4 Emission Factor (lb CH4/ MWh	N2O Emission Factor (lb N20/ MWh)	
PECO Electricity (Previous)	Electric	RCFE	188,298	716	0.061	0.008	
Hudson Electric (Previous)	Electric	SRMV	1,264,727	854.6	0.055	0.008	
Totals			**1,456,025**				
Purchased Electricity (eGRID) - Scope 2	CO2 tonne	CH4 tonne	N2O tonne	CO2e (tonne)	CH4 to CO2e (tonne)	N20 to CO2e (tonne)	TOTAL CO2e from region
PECO Electricity (Previous)	**61.15**	**0.00521**	**0.00068**	**61.154**	**0.145**	**0.181**	**61.48**
Hudson Electric (Previous)	**490.26**	**0.03155**	**0.00459**	**490.25**	**0.883**	**1.216**	**492.35**
Totals	**551.41**	**0.03676**	**0.00527**	**551.41**	**1.029**	**1.397**	**553.84**

Current Wind RECs

With the expiration of the townships energy contract in October depicted in which they bought the electricity grid mixes shown in Table 4, WN decided to source their energy from Hudson, buying Wind RECs. Although, there are no sources of carbon emissions from direct wind generation, this does not take into consideration the lifecycle GHG assessment for these

RECs. Therefore, we used the kWh carbon emission footprint generated by the BlueSky Model assessment of 13g CO_2e per kWh [5].

Using the previous annual data, this produces an estimate of the Wind RECs GHG emissions of 9.44 annual tonnes of CO2e. This is a reduction of the previous electricity generation emissions of almost 90%.

Natural Gas

The GHG emissions from natural gas were also produced using the EPA emission factors. As seen in Table 5, the natural gas emission factors were based off the CCF consumption of the township buildings, leading in a total CO_2 eq of 0.72 annual tonnes of CO_2eq. Natural gas falls under Scope 1 emissions.

Table 5: Annual GHG Calculations from Natural Gas

Stationary Source Natural Gas-Combustion (Table 1) Scope 1	Energy Type	Total Purchased ccf (Note: 1000 Ccf=1.037 mmBTU)		Kg CO2 per mmBtu (Table 1)	g CH4 per mmBtu (Table 1)		g N2O per mmBtu (Table 1)
PECO (Natural Gas)	Natural Gas	13,065		**53.06**	**1**		**0.1**
Stationary Source Natural Gas-Combustion (Table 1) Scope 1	CO2 tonne	CH4 tonne	N2O tonne	CO2e (tonne)	CH4 to CO2e (tonne)	N20 to CO2e (tonne)	TOTAL CO2e by Region
PECO (Natural Gas)	**0.71888**	**0.00001**	**0**	**0.71888**	**0.00038**	**0.00036**	**0.719**

Vehicles

Vehicles in the township are broken up into two separate categories: gasoline and diesel. Using the EPA factors, we determined the annual emissions from their vehicles; totaling to 180.24 and 12.03 annual tonnes of CO2e. The completed calculation methodology can be seen below in Table 6 with the Gasoline Powered Vehicles. The completed Diesel-Powered Vehicle calculations can be seen in Appendix D. Vehicles, both diesel and gasoline, fall under Scope 1 emissions.

Table 6: Annual GHG Calculations from Gasoline Powered Vehicles

Mobile Source Vehicle Combustion-gasoline - Scope 1		Gallons	Miles	Kg CO_2 /gallon	g CH_4 /mile	g N_2O /mile
Company Passenger Cars	Gasoline	4649	43636	**8.78**	**0.0173**	**0.0036**
Company Vans, Pickup trucks, SUVs	Gasoline	14,444	150,864	**8.78**	**0.0163**	**0.0066**
Company Passenger Cars, Company Vans, Pickup trucks, SUVs	Ethanol Component	2,121		**5.75**		
Totals						

Mobile Source Vehicle Combustion-gasoline - Scope 1	CO_2 tonne	CH_4 tonne	N_2O tonne	CO_2e (tonne)	CH_4 to CO_2e (tonne)	N_20 to CO_2e (tonne)	TOTAL CO_2e by Category
Company Passenger Cars	**40.81**	**0.00075**	**0.00016**	**40.81**	**0.0211**	**0.0416**	**40.88**
Company Vans, Pickup trucks, SUVs	**126.82**	**0.00246**	**0.001**	**126.82**	**0.0688**	**0.2638**	**127.15**
Company Passenger Cars, Company Vans, Pickup trucks, SUVs	**12.198**	**0**	**0**	**12.198**			**12.19**
Totals	**179.8404**	**0.00321**	**0.00115**	**179.84**	**0.0899**	**0.3054**	**180.23**

GHG Overview

The emissions were then compiled into two pie charts represented in Figure 10 and Figure 11. The goal was to determine which township source created the most amount of emissions and should be evaluated in detail. When the township was sourcing energy prior to wind RECs, we can observe the dominant GHG production from buildings, streetlighting, and pump sewage stations. The shift to Wind RECs now causes gasoline vehicles to be at the forefront of the township's energy GHG emissions. From the calculated emissions through electricity, natural gas, and vehicles, switching to wind RECs shows a drop of 757 MT CO_2e to 202MT CO_2e, almost a quarter of the prior energy emissions. It is important to note that these

only cover parts of Scope 1 and Scope 2 energy emissions, other factors such as lawn care tools, flying, and commuting vehicles, were not considered in this initial evaluation.

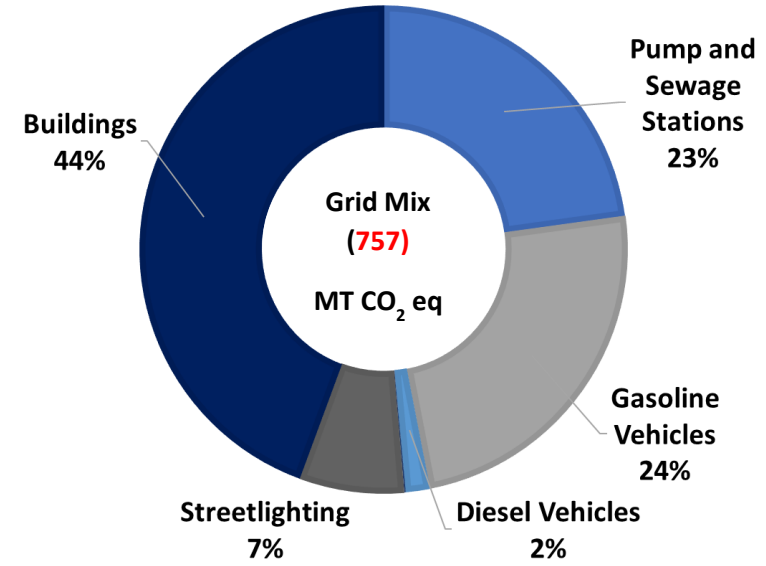

Figure 10: GHG Breakdown with Previous Electricity Sourcing

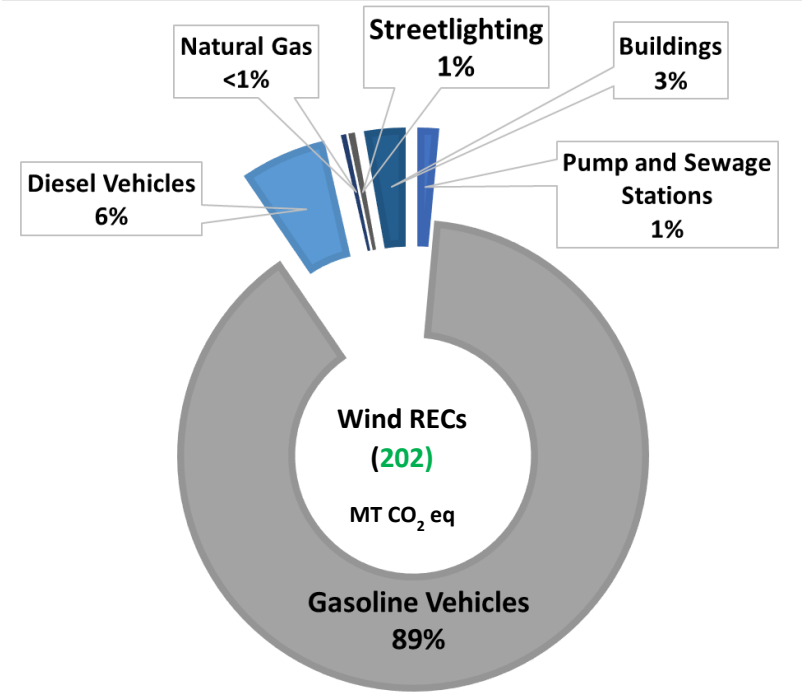

Figure 11: GHG Breakdown with the Transition to Wind RECs

Rebates

In order to assist the township through their RF100 transition, we searched for applicable rebates and incentives to improve their energy efficiency. We used DSIRE, a comprehensive database on incentives and policies that support renewable energy and energy efficiency programs in the United States. After filtering by location and local government incentives, we found PECO offers a Non-Residential Energy Efficiency Rebate Program that the township would qualify for [6]. The program offers rebates for lighting upgrades as well as various other energy saving upgrades ranging from vending machine controls upgrades to low-flow valves. PECO has an updated Commercial and Industrial Solutions Application Manual that recently went into effect with updated rebate amounts [7]. Several snapshots of these rebates that focus in HVAC can be seen in Appendices G and H.

This rebate program should be used for upgrading the lights throughout the town's buildings, whether its entire fixture replacements or retrofitting seen in Appendices E and F. With additional information on the existing lighting, an estimate can be made on the total rebate savings, as well as energy saved from switching to new lighting.

Community Days

Community days draw a lot of residents out for a day of entertainment. It presents a good opportunity to provide information to the community that is not only beneficial to themselves, but to the environment. A 'green' initiative table could offer energy saving tips and environmental information for the homes and businesses.

Information would be available to answer questions concerning what is acceptable and not acceptable at the curbside recycling. Additionally, it is helpful for the community to know where and when they can recycle electronics of all shapes and sizes such as TV's, monitors,

toasters, phones etc. A schedule of upcoming events would be on hand as well. For those looking to get rid of automotive oil, antifreeze, pesticides, paint, propane, thermometers etc., a schedule of upcoming hazardous waste disposal events would be available.

The table would also include ‘green’ items for sale. This is another opportunity to show residents there are green alternatives for a variety of products. For example, reusable sandwich bags, reusable snack bags, reusable straws, kitchen trash bags made from recycled materials, aluminum foil made from recycled aluminum, paper plates made from sugarcane versus Styrofoam, and so much more.

Educating residents is extremely important. Many do not know what or where things can be recycled or properly disposed of and do not know to look for items made from recycled materials. Providing that information is key for green lifestyle adoption to reduce the environmental impact of the township.

Residential Energy Conservation Tips

There are many ways to start reducing energy in your home today. You can begin by turning off lights when you leave a room. When doing a load of wash, use cold water. Instead of drying the clothes in the dryer, hang them to dry. If running the dishwasher, skip the dry cycle and let the dishes air dry. Other tips include opening the blinds verses turning on the lights, only using the ventilation fan in the bathroom and kitchen when needed, and do not use the washer, dryer, or dishwasher during peak hours. Also, when using the oven, don’t open the door to take a look, it causes the temp to drop and thus uses more energy to bring it back up.

Replacing your lightbulbs to LED’s, (a 12-watt LED takes 75 – 80% less energy than a traditional 60-watt bulb [8]), using power strips, installing a programmable thermostat, and purchasing energy efficient appliance are just a few other ways of saving energy & money.

Winter brings a whole different list of energy saving ideas. To start, wear more layers in the house versus turning up the thermostat, set the thermostat during the day to 68 degrees and lower to 60 degrees at night, and check for air leaks in the windows, ductwork & fireplace.

These are just the beginning tips to share with the residents and there are so many more to share. The West Norriton website and the fall and spring newsletters are great places for residents to find energy saving information and other 'green' initiatives.

Future Work

This semester's work focused on developing a concrete baseline for the energy use and GHG breakdown within West Norriton's energy sectors. The purpose for developing this baseline was to be utilized to determine critical points that can be further researched to reduce energy, GHGs, and township costs.

Vehicle Fleet

Working off the cost-fuel analysis this year, the next focus will now look at potential for electric vehicles (EVs) and plug in hybrid electric vehicles (PHEVs) in their departments, with a focus on the Police Department. These new recommendations will look at the cost of ownership, maintenance and registration costs, GHG emissions, and other environmental factors for different vehicle types (e.g. PHEV, HEV, EV).

GHG Further Analysis

The GHG analysis performed this year only took into consideration a few of the different energy sources that are available within the township. One of the sectors that we were not able to completely evaluate was the lawn care equipment and other gear that are owned by the Public Maintenance Department and the golf club. Lawn equipment such as weed whackers, leaf

blowers, lawn mowers, etc., do not have catalytic converters on their engines, and therefore emit a large amount of large particulate carbon.

In addition to covering a larger analysis on lawn equipment, this project can also look at golf and maintenance carts in the township, which are predominantly gasoline. Using a similar analysis as the vehicle fleet, a cost-benefit and environmental analysis can be done on alternatives.

By going into depth on more of these energy factors within the township, it means that this project will have a larger coverage over scope 1, scope 2, and scope 3 emissions that will give the township a larger understanding of what their environmental impact is. This project can give more recommendations on how to make these scopes more fuel efficient, environmentally friendly, and energy efficient. However, this project can also give suggestions on carbon offset, including reforesting and green space if applicable within the township, in line with the RF100 pledge.

Rooftop Solar

West Norriton Township has several buildings that may be suitable for solar energy generation. This includes the township office building and the Jefferson Golf Club. This group can look at the parameters of system sizing and capacity, capital investment for installation, and available grants and incentives for the township. After determining these specifications, the group can use Helioscope to estimate the generation capacity as well.

Rebates

This group should also continue to explore rebate options for the township. Now that different types of rebates have been sourced from PECO, the next major step is to perform a building audit, especially on the older facilities in West Norriton ownership. These audits will

record the amount of lighting fixtures, types of lights, HVAC equipment, boilers, refrigerators, and other types of equipment and machinery that can be analyzed. Through this analysis, the group can suggest energy efficient replacements, ROI timeframes, and available rebates through PECO.

Within this sphere, lighting and HVAC will be two primary focuses. Lighting can be extremely simple to analyze and change that would have the fastest return on investment with the most rebate options available, as seen in the appendices. HVAC can potentially have a larger upgrade to reduce natural gas consumption throughout the year, either in the form of an energy-efficient upgrade or a fuel type switch.

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Appendices

Appendix A – West Norriton Township Resolution #20-1654

West Norriton Township
Montgomery County, Pennsylvania

RESOLUTION #20- 1654

READY FOR 100 RENEWABLE ENERGY RESOLUTION

WHEREAS, climate change is a global long-term threat to civilization and Earth's living ecosystems;

WHEREAS, more frequent and extreme weather events will become commonplace;

WHEREAS, a major contributor to climate change is the continued use of fossil fuels by individuals, businesses and government agencies;

WHEREAS, the 2015 United Nations Climate Change Conference in Paris resulted in a consensus among all 195 countries to limit the increase in global average temperatures to well below 2 degrees Celsius, ensure that greenhouse gas emissions will not exceed sinks (total carbon capture) by the second half of this century, and become carbon neutral between 2050 and 2100;

WHEREAS, in January 2019, Governor Tom Wolf has issued an executive order stating, "the Commonwealth will work to achieve a 26 percent reduction of greenhouse gas emissions by 2025 and an 80 percent reduction by 2050";

WHEREAS, the municipalities of Abington, Cheltenham, Plymouth, Springfield, Upper Merion and Whitemarsh Townships, Ambler, Bridgeport, Conshohocken, Narberth and Norristown Boroughs in Montgomery County and Phoenixville, West Chester, Downingtown and others in Chester County and Delaware County have stepped up as regional leaders in setting goals for the transition to renewable energy in their communities;

WHEREAS, West Norriton Township has demonstrated a commitment to reducing its energy usage by implementing energy efficiency improvements in multiple areas, including:

- Municipal building energy efficiency improvements, resulting in reduced energy usage and energy costs
- Lighting and energy system improvements at township facilities, resulting in reduced energy usage and energy costs
- LED traffic light and street light upgrades throughout the Township resulting in reduced energy usage and energy costs;

WHEREAS, West Norriton Township is committed to be a community characterized by equality, health, safety, livability, prosperity and equity;

WHEREAS, West Norriton Township recognizes that it has a responsibility to future generations to take an active stance to reduce the emission of greenhouse gases within the Township;

WHEREAS, the best strategy for achieving a cost effective, even cost saving, energy source transition is through collaboration with other Montgomery County energy leaders and participation in acquiring aggregated procurement contracts – Power Purchase Agreements (PPAs) for regional wind and solar energy; to this end, West Norriton Township also recognizes the importance of developing a close working relationship with its electric energy supplier(s) to create the most advantageous and mutually beneficial plan for integrating locally generated and renewable power;

AND WHEREAS, a renewable energy initiative can produce energy cost savings for residents and local businesses while stimulating new economic activity and local jobs, all while simultaneously mitigating the risks from climate change for everyone;

BE IT RESOLVED THAT:

- West Norriton Township will join other leading towns and cities in the national Ready for 100 movement, to transition to 100% clean, renewable energy, and complete this transition, community-wide, to
  - 100% clean renewable electricity by 2035;
  - 100% clean renewable energy when replacing heating system and transportation equipment by 2050;
  - As vehicles are replaced, priority will also be given to transitioning the township vehicle fleet to 100% renewable energy sources by 2030 where feasible;
- The West Norriton Township Environmental Advisory Council in conjunction with other similar local groups will provide guidance for commissioning a committee, task force, and/or consultant to draft an energy transition plan for achieving these goals, to include interim milestones, financial impacts, equity metrics, potential financing mechanisms and the percentage of renewable energy that is locally produced;
- Locally produced and distributed energy is prioritized whenever feasible for the many advantages it provides to the community;
- West Norriton Township stakeholders and residents will be encouraged to achieve their own renewable energy goals and the Environmental Advisory Council will use their educational mandate to help achieve this;
- West Norriton Township will call on the Commonwealth of Pennsylvania to set a goal to use 100% renewable energy for all purposes no later than 2050;
- West Norriton Township Board of Commissioners will call on the Commonwealth of Pennsylvania to adopt codes and standards to increase the efficiency of buildings and appliances;
- West Norriton Township will call on the Commonwealth of Pennsylvania to increase the Alternative Energy Portfolio Standards to levels that put us on track to meet 100% renewable energy goals;
- *West Norriton Township will seek to work with other Montgomery County Municipalities and the Montgomery County Planning Commission and/or Delaware Valley Regional Planning Commission to create an energy planner/advocate position. The energy planner/advocate will develop and implement renewable energy strategies for Montgomery County municipalities, residents, businesses, and institutions. Alternatively, an energy planning firm may be contracted to create the energy transition plan or supplement an energy transition plan outlined by a volunteer and staff task force.*

ADOPTED, this 14th day of April, 2020

ATTEST:

By: _____
Jason Bobst, Secretary

WEST NORRITON TOWNSHIP
BOARD OF COMMISSIONERS:

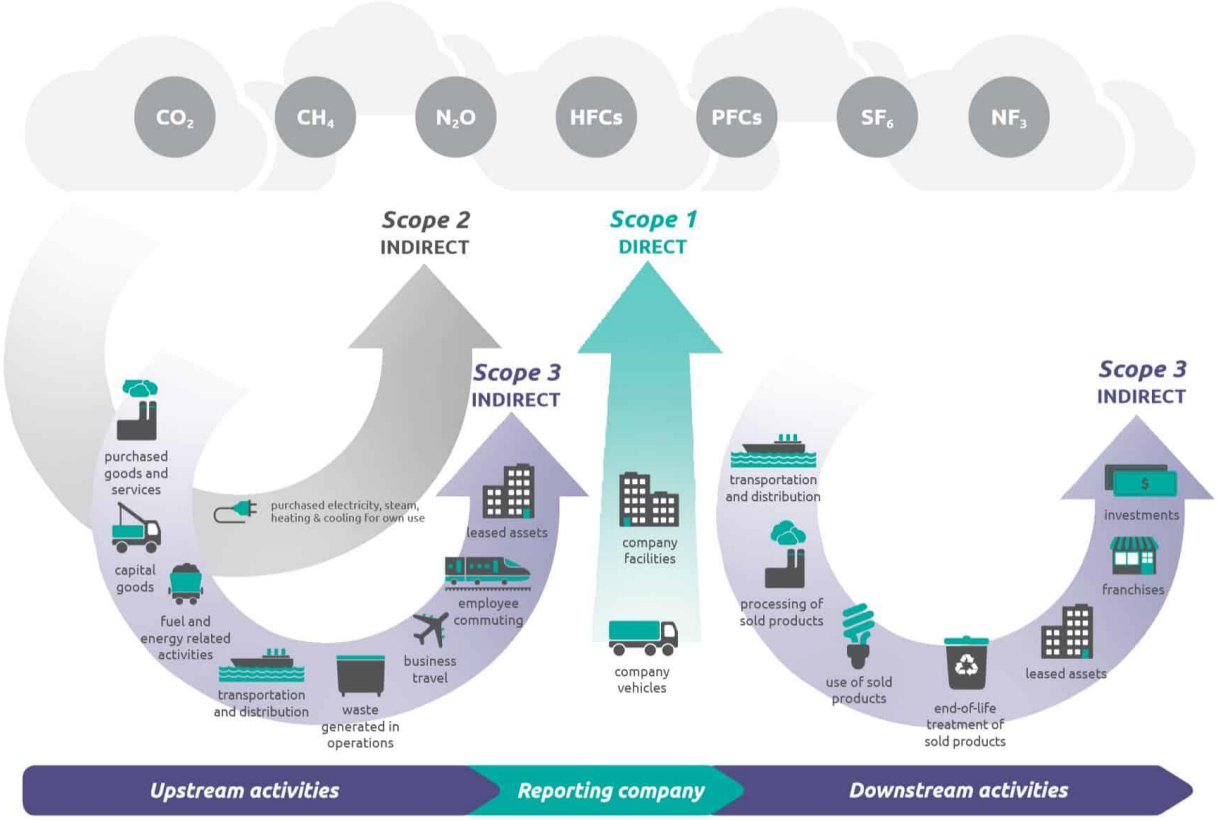
By: _____
Martin Miller, President

Appendix B- Detailed Energy Sourcing Economic Comparison

Yr	Grid (Current)	Aggregated Solar PPA (0.06$/kwh)	Wind PPA (0.04$/kwh)	Solar PPA (0.1$/Kwh)	PA Hudson (100% Clean Energy - 5 year Contract)	PA Hudson (100% Grid Mix - 5 Year Contract)	PA Hudson (100% Clean Energy - 1 year Contract)
1	$58,740.00	$51,982.26	$34,654.84	$86,637.10	$43,751.74	$43,751.74	$43,145.28
2	$60,502.20	$53,021.91	$35,347.94	$88,369.84	$43,751.74	$43,751.74	$44,008.18
3	$62,317.27	$54,082.34	$36,054.90	$90,137.24	$43,751.74	$43,751.74	$44,888.34
4	$64,186.78	$55,163.99	$36,775.99	$91,939.98	$43,751.74	$43,751.74	$45,786.11
5	$66,112.39	$56,267.27	$37,511.51	$93,778.78	$43,751.74	$43,751.74	$46,701.83
6	$68,095.76	$57,392.62	$38,261.74	$95,654.36	$44,626.77	$45,064.29	$47,635.87
7	$70,138.63	$58,540.47	$39,026.98	$97,567.45	$44,626.77	$45,064.29	$48,588.59
8	$72,242.79	$59,711.28	$39,807.52	$99,518.80	$44,626.77	$45,064.29	$49,560.36
9	$74,410.07	$60,905.50	$40,603.67	$101,509.17	$44,626.77	$45,064.29	$50,551.57
10	$76,642.38	$62,123.61	$41,415.74	$103,539.35	$44,626.77	$45,064.29	$51,562.60
11	$78,941.65	$63,366.08	$42,244.06	$105,610.14	$45,519.31	$46,416.22	$52,593.85
12	$81,309.90	$64,633.41	$43,088.94	$107,722.34	$45,519.31	$46,416.22	$53,645.73
13	$83,749.19	$65,926.07	$43,950.72	$109,876.79	$45,519.31	$46,416.22	$54,718.64
14	$86,261.67	$67,244.60	$44,829.73	$112,074.33	$45,519.31	$46,416.22	$55,813.01
15	$88,849.52	$68,589.49	$45,726.33	$114,315.81	$45,519.31	$46,416.22	$56,929.28
16	$91,515.01	$69,961.28	$46,640.85	$116,602.13	$46,429.69	$47,808.70	$58,067.86
17	$94,260.46	$71,360.50	$47,573.67	$118,934.17	$46,429.69	$47,808.70	$59,229.22
18	$97,088.27	$72,787.71	$48,525.14	$121,312.86	$46,429.69	$47,808.70	$60,413.80

19	$100,000.92	$74,243.47	$49,495.65	$123,739.11	$46,429.69	$47,808.70	$61,622.08
20	$103,000.95	$75,728.34	$50,485.56	$126,213.90	$46,429.69	$47,808.70	$62,854.52
Total	$1,578,365.80	$1,263,032.19	$842,021.46	$2,105,053.66	$901,637.52	$915,204.71	$1,048,316.72
Expected average annual utility bill	$78,918.29	$63,151.61	$42,101.07	$105,252.68	$45,081.88	$45,760.24	$52,415.84
Expected average KWh Price	$0.09	$0.07	$0.05	$0.12	$0.05	$0.05	$0.06
Savings % with respect to grid price	**0%**	**20%**	**47%**	**-33%**	**43%**	**42%**	**34%**

Appendix C – Scope 1, 2, and 3 Emissions – Compare Your Footprint [9]



Appendix D – GHG Calculations from Diesel Powered Vehicles

Mobile Source Vehicle Combustion-Diesel (Table 2, 4, 5) - Scope 1		Gallons	Miles	Kg CO_2/gallon (Table 2)		g CH_4 /mile (Table 4)	g N_2O /mile (Table 4)
Company Diesel Light-Duty Trucks, On Road (ie. Ambulances)	Diesel	28	217		**10.21**	**0.001**	**0.0015**
Company Diesel Medium and Heavy Duty Trucks, On Roads	Diesel	1,006	59,000		**10.21**	**0.0051**	**0.0048**
Company - Construction Equipment, Off Road, Diesel	Diesel	136	96		**10.21**	**0.0051**	**0.0048**
Totals							
Mobile Source Vehicle Combustion-Diesel (Table 2, 4, 5) - Scope 1	CO_2 tonne	CH_4 tonne	N_2O tonne	CO_2e (tonne)	CH_4 to CO_2e (tonne)	N_20 to CO_2e (tonne)	TOTAL CO_2e by Category
Company Diesel Light-Duty Trucks, On Road (ie. Ambulances)	**0.2860**	**0**	**0**	**0.2860**	**0.00001**	**0.00009**	**0.28612**
Company Diesel Medium and Heavy Duty Trucks, On Roads	**10.2716**	**0.0003**	**0.00028**	**10.271**	**0.00843**	**0.07505**	**10.355**
Company - Construction Equipment, Off Road, Diesel	**1.3888**	**0**	**0**	**1.3888**	**0.00001**	**0.00012**	**1.388**
Totals	**11.9464**	**0.0003**	**0.00028**	**11.946**	**0.00844**	**0.07526**	**12.030**

Appendix E – Retrofit Lighting Incentives [7]

Retrofit Lighting Incentives

Category	Measure Code	Measure Name	Incentive per unit	Incentive Unit	Technical Specifications
Linear Fluorescent	FL1	Interior T5 New Fluorescent Fixture w/ Electronic Ballast	$1	fixture	Any T5 is eligible
Linear Fluorescent	FL2	T5HO High-Bay Fixture	$50	fixture	• Fixture efficiency must be > 90% • High bay fixtures must be 15 ft above floor
Linear Fluorescent	FL3	HPT8 High-Bay Fixture	$40	fixture	
Linear Fluorescent	FL4	HPT8 Fixture	$1	fixture	Must use Low Ballast Factor (<.80)
Linear Fluorescent	FL5	RW T8 Lamp - Lamp only	$1	lamp	Existing T8 fixture re-ballasting to a higher ballast factor are not eligible.
High Intensity Discharge	HID1	Ceramic HID - 25 -39 Watt	$5	fixture	
High Intensity Discharge	HID2	Ceramic HID - 70 Watt	$5	fixture	
High Intensity Discharge	HID3	Ceramic HID - 100 Watt	$5	fixture	• Replacing higher wattage HID or High Pressure Sodium or Mercury Vapor • Interior replacements only
High Intensity Discharge	HID4	Pulse Start HID - 150 nominal Watts	$10	fixture	
High Intensity Discharge	HID5	Pulse Start HID - 350 nominal Watts	$10	fixture	
High Intensity Discharge	HID6	Pulse Start HID - 1,000 nominal Watts	$10	fixture	
Interior LED	LED1	ENERGY STAR Integral LED fixture: Indoor Recessed Downlight Retrofit Module	$10	fixture	
Interior LED	LED2	ENERGY STAR Integral LED fixture: Indoor Recessed Downlight	$10	fixture	
Interior LED	LED3	ENERGY STAR Integral LED fixture: Indoor Portable Lamp/Torchiere	$1	fixture	
Interior LED	LED4	ENERGY STARLED Accent/Track Lighting Fixtures	$1	head	
Interior LED	LED9a	LED Surface and Suspended Linear Fixtures, 2'	$5	fixture	
Interior LED	LED9b	LED Surface and Suspended Linear Fixtures, 4'	$10	fixture	e.g., wrap, vapor tight, and strip fixtures
Interior LED	LED9c	LED Surface and Suspended Linear Fixtures, 8'	$25	fixture	
Interior LED	LED8a	DLC LED Troffer Fixtures and Retrofit Kits, 2'	$10	fixture	Troffers typically installed in lay-in ceilings, 2x2 configuration
Interior LED	LED8b	DLC LED Troffer Fixtures and Retrofit Kits, 4'	$12	fixture	Troffers typically installed in lay-in ceilings, 1x4, 2x4 configuration
Hi/Low-bay LED	LED5a	DLC LED Low-Bay Fixtures, 4,000-10,000 LED lumenss	$70	fixture	
Hi/Low-bay LED	LED5b	DLC LED Low-Bay Fixtures, 10,001-20,000 LED lumenss	$70	fixture	
Hi/Low-bay LED	LED5c	DLC LED Low-Bay Fixtures, >20,000 LED lumenss	$70	fixture	•For replacement of HID fixtures mounted ≤ 15' above finished floor
Hi/Low-bay LED	LED6a	DLC LED Low-Bay Retrofit Kits, 4,000-10,000 LED lumenss	$70	fixture	•For Retrofit Kits, see installation requirements on Mogul LED requirements page
Hi/Low-bay LED	LED6b	DLC LED Low-Bay Retrofit Kits, 10,001-20,000 LED lumenss	$70	fixture	
Hi/Low-bay LED	LED6c	DLC LED Low-Bay Retrofit Kits, >20,000 LED lumenss	$70	fixture	
Hi/Low-bay LED	LED10A	DLC LED High-Bay Fixtures, ≤20,000 LED lumens	$70	fixture	•High bay fixtures must be installed at least 15ft above floor
Hi/Low-bay LED	LED10B	DLC LED High-Bay Fixtures, > 20,000 LED lumens	$70	fixture	•For Retrofit Kits, see installation requirements on Mogul LED requirements in Project Manual
Hi/Low-bay LED	LED11A	DLC LED High-Bay Retrofit Kits, ≤ 20,000 LED lumens	$70	fixture	
Hi/Low-bay LED	LED11B	DLC LED High-Bay Retrofit Kits, >20,000 LED lumens	$70	fixture	

Appendix F – PECO Instant Lighting Discounts [10]

Instant Lighting Discounts for Business

Effective November 12, 2020

Lighting Equipment	Lumen Level	Discount Level
DLC 2', 3' TLED Tubes	All Lumens	$2
DLC 4' TLED Tubes	All Lumens	~~$2~~ ***$4***
DLC 8' TLED Tubes	All Lumens	~~$2~~ ***$7***
DLC High-Bay and Low-Bay Fixtures and Retrofit Kits	> 3,850	~~$50~~ ***$70***
DLC Exterior Fixtures and Retrofit Kits for Streetlights	> 250	~~$50~~ ***$75***
DLC Exterior Fixtures and Retrofit Kits for Canopies and Garages	> 250	~~$30~~ ***$50***
DLC Exterior Fixtures and Retrofit Kits for Wallpacks	> 250	~~$20~~ ***$40***
DLC Exterior Flood Fixtures or Retrofit Kits	All Lumens	$20
DLC 2' Troffers, Surface and Suspended Linear Fixtures and Retrofit Kits	1,500–5,500	$4
DLC 4' Troffers, Surface and Suspended Linear Fixtures and Retrofit Kits	< 12,783	$8
DLC 8' Troffers, Surface and Suspended Linear Fixtures and Retrofit Kits	< 9,871	~~$10~~ ***$20***
LED Exit Sign, Single-Sided*	N/A	$3
LED Exit Sign, Double-Sided*	N/A	$5
ENERGY STAR® LED Screw-In Globe, PAR, R20 and Specialty Lamps	All Lumens	$2
ENERGY STAR LED Screw-In BR30, BR40 Lamps	400–1,200	$2
ENERGY STAR LED Recessed Downlight Fixtures or Retrofit Kits	300–4,500	$8
ENERGY STAR LED MR16 Lamps (GU5.3, GX5.3, GU10 Pin Base)	(< 11 Watts) 500–1,000 Lumens (12–16 Watts) 1,001–1,500 Lumens (All Watts) > 1,501 Lumens	$2
ENERGY STAR LED GU24 Pin-Based Lamps, DLC 4-Pin Replacement Lamps for CFLs	(< 11 Watts) 500–1,000 Lumens (12–16 Watts) 1,001–1,500 Lumens (All Watts) > 1,501 Lumens	$0.50

Appendix G – Incentives for Commercial and Industrial Customers [11]

PECO Smart Ideas for Your Business

Incentives for Commercial and Industrial Customers

PECO
An Exelon Company

Effective November 12, 2020

Qualifying equipment is subject to the specifications, terms and conditions outlined in the program application and application manual for Phase III. Incentives are available until May 15, 2021, or while funds last.

Interior Lighting Equipment Type	Incentive	Unit
DLC 2' and 3' TLED Tubes	$3	Lamp
DLC 4' TLED Tubes	~~$4~~ $5	Lamp
DLC 8' TLED Tubes	~~$6~~ $7	Lamp
DLC Pin-Based LED Lamp	$0.50–$1.00	Lamp
ENERGY STAR® Integral LED Fixture or Retrofit Kit	$10	Fixture
ENERGY STAR GU24 Pin-Based LED Lamp	$1	Lamp
ENERGY STAR MR16 Pin-Based LED Lamp	$3	Lamp
ENERGY STAR Screw-In Decorative, Globe or Directional/Reflector Lamp	$4	Lamp
HPT8 and T5 Fixtures	$1	Fixture
HPT8 High-Bay Fixture	$40	Fixture
Interior Ceramic HID Lamp	$5	Lamp
Interior Pulse Start HID	$10	Lamp
LED Accent/Track Lighting Fixture	$1	Head
LED Indoor Channel Signage	$1	Letter
LED Exit Sign	$10	Sign
LED High-Bay Fixtures and/or Retrofit Kits	~~$60~~ $70	Fixture
LED Low-Bay Fixtures and/or Retrofit Kits	~~$60~~ $70	Fixture
LED Refrigerated Vertical Door (Case and Freezer)	$15	Door
LED Refrigeration Case Lighting (Open Case)	$0.05	kWh Saved
LED Troffer Linear Fixtures 2'	$10	Fixture
LED Troffer Linear Fixtures 4'	$12	Fixture
NEW LED Surface and Suspended Linear Fixtures 2'	$5	Fixture
NEW LED Surface and Suspended Linear Fixtures 4'	$10	Fixture
NEW LED Surface and Suspended Linear Fixtures 8'	$25	Fixture
Reduced Wattage T8 Lamp	$1	Lamp
T5 HO High-Bay Fixture	$50	Fixture
Unitary Sensor Controls	$5	Sensor
Controls Combination — Daylighting and Occupancy, Fixture Mounted	$5	Sensor
Interior Central Lighting Controls	$0.01	Sq. Ft.
Indoor Permanent Fixture Removal	$0.25	Watts Reduced

Exterior Fixtures	Incentive	Unit
LED Parking Garage and Canopy Fixtures and Retrofit Kits	$35–$70	Fixture
ENERGY STAR Integral LED Fixture — Outdoor Recessed Downlight and Retrofit Module	$10	Fixture
LED Outdoor Flood Light Fixtures	$25	Fixture
LED Pole/Arm-Mounted Parking and Roadway Fixtures and Retrofit Kits	~~$20–$75~~ $75–$100	Fixture

Exterior Fixtures	Incentive	Unit
LED Wall Mount Fixtures and Retrofit Kits	~~$20–$50~~ $40–$75	Fixture
Outdoor Permanent Fixture Removal	$0.25	Watts Reduced
LED Traffic, Turn and Pedestrian Signals	$5	Signal
LED Outdoor Channel Signage	$1	Letter

Plug Load Control	Incentive	Unit
Tier 2 Advanced Power Strip	$1	Unit

HVAC	Incentive	Unit
Air-Cooled or Water-Cooled Air Conditioner	$10	Ton
Air-Cooled Heat Pump	$25	Ton
Water-Cooled Heat Pump	$50	Ton
Packaged Terminal Air Conditioner (PTAC)	$30	Ton
ENERGY STAR Ductless Mini-Split Heat Pump	$10	Ton
Ground Source, Water Source and Groundwater Source Heat Pump	$15	Ton

Unitary HVAC Chillers	Incentive	Unit
Air-Cooled Chiller	$7	Ton
Water-Cooled Chiller	$5	Ton

Other HVAC Measures*	Incentive	Unit
Hotel Guest Room Occupancy Sensors (Electric Resistance Heat and Air Conditioning)	$30	Room
Integrated Dual Enthalpy Economizer Controls	$2.50	Ton
Circulation Fan — High-Volume, Low-Speed	$15	Unit
Electronically Commutated Motor (ECM) Circulation Fan	$1	Fan
ECM Circulation Pump	$1	Pump
Retrocommissioning, Cooling Systems**	$0.75	Ton
Retrocommissioning, Whole Building†	$0.15	Sq. Ft.
Energy Management System**	$40	Ton
Demand Controlled Ventilation**	$25	Ton

Refrigeration	Incentive	Unit
Anti-Sweat Heater Controls	$50	Door
Evaporator Coil Defrost Controls	$52	Controller
Evaporator Fan Controls	$7	Controller
Floating-Head Pressure Controls	~~$7~~ $50	HP
Automatic Door Closers	$20	Door
Evaporator Fan ECM for Refrigerated Cases	$7.50	Motor

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Effective November 12, 2020

Refrigeration	Incentive	Unit
ENERGY STAR Commercial Freezer	$75	Unit
ENERGY STAR Commercial Refrigerator	$10	Unit
Suction Pipe Insulation	$0.20	Linear Foot
Night Cover	$2.50	Night Cover
Strip Curtains	$1	Linear Foot
Variable-Speed Refrigeration Compressor	~~$10~~ $40	Compressor
Doors Added to Open Refrigerated Cases	~~$15~~ $75	Door
Door Gaskets	$1	Door
Zero Energy Doors	$17.50	Door
Air-Cooled Refrigeration Condenser	$10	Ton
Oversized Condenser With Variable-Frequency Drive	$5	HP
Case Light Occupancy Controls	$3.50	Door

Food Service	Incentive	Unit
Beverage Machine Controls	$12.50	Unit
Snack Machine Controls	$10	Unit
ENERGY STAR Refrigerated Beverage Vending Machines	$62.50	Unit
ENERGY STAR Electric Steam Cooker	$75	Unit
ENERGY STAR Combination Oven	$75	Unit
ENERGY STAR Commercial Convection Oven	$75	Unit
ENERGY STAR Commercial Fryers	$30	Unit
ENERGY STAR Commercial Hot Holding Cabinet	$100	Cabinet

Motors and Drives	Incentive	Unit
Variable-Frequency Drive on HVAC Fan, Chilled Water or Heating Hot Water Pump	$50	HP
Variable-Speed Drive on Kitchen Exhaust Fan	$250	HP
Variable-Speed Drive on Process Motor < 50 HP	$50	HP
Early Replacement Motors With Premium Efficiency Motors	$20	Motor
Variable-Speed Drive on Dust Collection System Motor	$10	HP

Domestic Hot Water	Incentive	Unit
Fuel Switch — Electric Water Heater to ENERGY STAR Commercial Gas Water Heater	$50	Unit
Heat Pump Water Heater From Electric Coil Water Heater	$1	Water Heater
Low-Flow, Pre-Rinse Spray Valve	$1	Valve

Custom Measures	Incentive	Unit
All Retrofit Custom Measures	$0.05	kWh saved

LED Traffic Signals	Incentive	Unit
Round Signals, 8" and 12"	$5	Sign
Turn Signals, 8" and 12"	$5	Sign
Pedestrian Signals, 9", 12" and 16"	$5	Sign

Compressed Air	Incentive	Unit
No-Loss Condensate Drains	$10	Drain
Air-Entraining Air Nozzle	$2.50	Nozzle
Storage Tanks for Load/No Load Screw Compressors	$5	Compressor HP
Cycling Refrigerated Thermal Mass Dryer	$5	Compressor HP
Variable-Speed Air Compressor	$40	Compressor HP
Compressed Air System Optimization	$10	Compressor HP

New Construction — Interior Lighting††	Incentive	Unit
≥ 10% of Code	$0.12	Sq. Ft.

New Construction — Whole Building Systems	Incentive	Unit
≥ 10% of Code	$0.15	Sq. Ft.

Data Centers	Incentive	Unit
Air-Cooled Chiller	$5	Ton
Air-Cooled Chiller Without Condenser	$5	Ton
Computer Room Air Conditioner	$5	Ton
Efficient Fans for CRAH or CRAC Units	$5	Ton
Water-Cooled Centrifugal Chiller	$5	Ton
Water-Cooled Positive Displacement or Reciprocating Chiller	$5	Ton
Uninterruptible Power Supply, 20–100 kVA	$0.50	kVA
Mainframe Refresh	$2.50	kW Installed
Server Refresh	$2.50	kW Installed
PC Power Management System	$3	PC Controlled
HVAC System Optimization	$0.02	kWh Saved
Hot/Cold Aisle Containment	$0.02	kWh Saved
Server Virtualization	$200	kW Reduction
Thin Clients	$2.50	Thin Client

Note: Specific equipment will determine the exact incentive level when an incentive range is provided. All lighting products must be DLC or ENERGY STAR certified.
*Must meet minimum SEER requirements.
**Subject to actual kWh savings achieved.
†To be eligible for an incentive, the project must save a minimum of 1 kWh per square foot.
††New construction interior lighting controls and exterior lighting power efficiencies that exceed code will be incentivized as custom measures using $0.05/kWh rate.

▶ **To discuss a project**, call us at **1-844-4BIZ-SAVE** (1-844-424-9728) or visit **peco.com/business** for more information.

PE-CI-RS-1120

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Appendix H – HVAC Rebates [7]

Measure Code	Cooling Capacity	Cooling Qualifying Efficiency (full load, part load)	Heating Qualifying Efficiency	Incentive ($ per cooling ton)
Air Cooled Air Conditioner				
H01	< 5.4 tons (< 65,000 Btu/hr)	11.3 EER, 15 SEER	N/A	$10
H02	≥ 5.4 and < 11.25 tons, (≥ 65,000 Btu/h and < 135,000 Btu/hr)	11.2 EER, 12.5 IEER	N/A	$10
H03	≥11.25 and < 20 tons (≥ 135,000 and < 240,000 Btu/hr)	11.0 EER, 12.3 IEER	N/A	$10
H04	≥ 20 and < 63.33 tons, (≥ 240,000 and < 760,000 Btu	10.0 EER, 11.1 IEER	N/A	$10
H05	≥ 63.33 tons (≥ 760,000 Btu/hr)	9.7 EER, 10.3 IEER	N/A	$10
Air Cooled Heat Pumps				
H06	< 5.4 tons (< 65,000 Btu/hr)	11.3 EER, 14.3 SEER	8.7 HSPF	$25
H07	≥ 5.4 and < 11.25 tons (≥ 65,000 Btu/h and < 135,000 Btu/hr)	11.0 EER, 12.3 IEER	3.3 COP	$25
H08	≥11.25 and < 20 tons (≥ 135,000 Btu/h and < 240,000 Btu/hr)	10.6 EER, 11.7 IEER	3.2 COP	$25
H09	≥ 20.00 tons (240,000 Btu/hr)	9.5 EER, 10.5 IEER	3.2 COP	$25
Packaged Terminal Systems (PTAC and PTHP)			(Heat Pumps only)	
H10	< 8000 Btu/hr (<0.66 tons)	11.8 EER	3.3 COP	$30
H11	≥ 8,000 and <10,500 Btu/hr (≥ 0.66 and < 0.875 tons)	11.4 EER	3.2 COP	$30
H12	≥ 10,500 Btu/hr (≥ 0.875 tons)	10.7 EER	3.1 COP	$30
Ductless Mini-Split Heat Pump				
H13	< 65,000 Btu/hr (< 5.4 tons)	12 EER, 14.5 SEER	8.2 HSPF	$10
Ground Source Heat Pump				
H14	<135,000 Btu/hr (<11.25 tons)	13.4 EER	3.1 COP	$15
Water Cooled Heat Pump				
H15	<17,000 Btu/hr (<1.4 tons)	11.2 EER	4.2 COP	$50
H16	17,000-65,000 Btu/hr (1.4 - 5.4 tons)	12.0 EER	4.2 COP	$50
Groundwater Source Heat Pump				
H17	<135,000 Btu/hr (11.25 tons)	16.2 EER	3.6 COP	$15
Water Cooled Air Conditioner				
H22	< 5.4 tons (< 65,000 Btu/hr)	12.1 EER, 12.3 IEER	N/A	$10
H23	≥ 5.4 and < 11.25 tons (≥ 65,000 Btu/h and < 135,000 Btu/hr)	12.1 EER, 12.3 IEER	N/A	$10
H24	≥11.25 and < 20 tons (≥ 135,000 Btu/h and < 240,000 Btu/hr)	12.5 EER, 12.7 IEER	N/A	$10
H25	≥20 and < 63.3 tons (≥ 240,000 Btu/h and < 760,000 Btu/hr)	12.4 EER, 12.6 IEER	N/A	$10
H26	≥ 63.3 tons(≥760,000 Btu/hr)	11.0 EER, 11.1 IEER	N/A	$10